SECOND EDITION

THE NAVIGATOR

OR

MARINERS' GUIDE

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THE NAVIGATOR OR MARINERS' GUIDE

A BOOK CONTAINING VALUABLE ORIGINAL INFORMATION CAREFULLY COMPILED

"NEW JERSEY" COPPER PAINT

PUBLISHED BY

NEW JERSEY PAINT WORKS

HARRY LOUDERBOUGH
PROPRIETOR.

"NEW JERSEY" Anti-Fouling Composition

JERSEY CITY, N.J., U.S.A.

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PUBLISHER'S NOTICE.

As the publication of "The Navigator or Mariners' Guide" has increased in demand and popularity, it has received very strong endorsements from ship owners, mariners, and yachtsmen, and also from many marine journals. This has induced a piracy on some of our original and best written articles that have been obtained after a great deal of research and assistance from the most practical and experienced marine authors, and the expenditure of a great deal of time and money.

No expense has been spared to make this (second) edition, without question, the best reference book for the mariner ever published.

ALL PERSONS ARE HEREBY NOTIFIED that the matter contained in this work, as well as the general arrangement of tables, etc., is copyright matter, and that action will be taken on any infringement of my rights to the same.

HARRY LOUDERBOUGH.

ERRATA.

Page 62. In "DIVISION," bottom line, "The Pilot and How to do the Work," should read "Pugsley's Guide to Local Inspector's Examination."

Page 63. In example at bottom of page, second line, "Lat. Cape St. Mary" should be 44° 05′ 20″, not 45° 05′ 20″.

THE NAVIGATOR

OR

MARINERS' GUIDE

A HANDY REFERENCE WORK FOR THE USE OF NAVIGATORS, YACHTSMEN AND STUDENTS OF NAVIGATION

National Export Exposition Medal

Marine Specialties

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MANY OTHER USEFUL
CALCULATIONS AND
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CAPT. R. M. PUGSLEY

(LATE MASTER U. S. TRANSPORT SERVICE)

AUTHOR OF "THE PILOT," "HOW TO DO THE WORK," ETC.

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PRICE $2.00

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NEW JERSEY PAINT WORKS

(HARRY LOUDERBOUGH, PROPRIETOR)

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IMPORTANT NOTICE.

In presenting this second edition to our thousands of friends using NEW JERSEY MARINE PAINTS, it is to be understood that its contents are not a compilation of worthless matter extracted from the many useless nautical publications put on the market during the last few years by persons having no sea experience and no practical knowledge on which to construct a work of true worth to the navigator, yachtsman and all others interested in marine matters.

In the manufacture of NEW JERSEY COPPER PAINT and MARINE PAINT SPECIALTIES, our great aim has been to produce PAINTS of a SUPERIOR QUALITY for the various purposes for which they may be used. Regarding the superior quality of these PAINTS, there can be no stronger support to the statement, than in the fact that the demand for NEW JERSEY COPPER PAINT and MARINE PAINT SPECIALTIES is constantly increasing, and also the facilities for their manufacture, that this demand may be met.

That our PAINTS are THE BEST, is a fact conceded by all who have used them for the purposes for which they are manufactured. However, that does not fully satisfy us; as we not only keep up the standard but, as in the past, we devote all our experience and skill to raise the standard of quality of our product. We manufacture but one grade of PAINT, and that is THE BEST.

Just as NEW JERSEY COPPER PAINT and MARINE PAINT SPECIALTIES are prepared by those having experience and skill in their particular line, so is this work constructed by an experienced and skillful navigator and shipmaster who has a thorough knowledge of the requirements of the navigator, yachtsman and student; and every subject appertaining to them, and of valuable interest, possible in a work of this size has been treated.

Any person who uses this book and NEW JERSEY COPPER PAINT and MARINE PAINT SPECIALTIES together with their respective instructions and directions, will be able to navigate his vessel with safety and despatch.

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PREFACE TO SECOND EDITION.

15,000 COPIES.

THE previous edition (15,000 copies) of this work having been exhausted and the demand having constantly increased, this edition is revised and enlarged by adding much valuable matter not generally found in a work of this kind, and which does not exist in a manner conveniently accessible to those for whom this volume is intended, and in so doing the requirements of the practical experienced navigator and the yachtsman and student have been considered with equal care, at the same time preserving the general arrangement of the orginal work.

While this volume is a handy and comprehensive reference work, it is in consequence of the many changes and character of new matter also an epitome of navigation, with the exception of the tables, which are not included, as those of Bowditch cannot easily be improved on and are to be preferred to any other.

R. M. PUGSLEY.

PREFACE, FIRST EDITION.

THIS work is intended to meet the ever-increasing demand for a handy and comprehensive volume for the general use of navigators, yachtsmen and others, who frequently find it necessary to look up something quickly regarding navigation or other nautical information.

Care has been exercised in constructing the work to introduce only such matter as is known to be of real value to those interested in nautical subjects, and attention is called to the many tables and general information, in addition to navigation, that are almost indispensable to any shipmaster or officer.

In most works on navigation, the subject is buried in technicalities and complications to so great a depth that the student cannot acquire it without taking up the study of the subject to the exclusion of all other matters. In this work, navigation is brought to the surface, and within easy reach of the student. Any person of average intelligence can acquire a fair knowledge of navigation by a little study of the subject as treated in these pages.

The various problems in navigation are made as plain as possible that the requirements of the student, as well as the navigator, may be met. However, only the most reliable and correct methods of determining latitude and longitude by observation and dead reckoning are given.

Bowditch tables are used in all calculations throughout the work, and where table numbers are mentioned, those of Bowditch and no others are referred to.

The rules for using the barometer for foretelling the weather and for handling vessels in hurricanes are not written from theory alone, but from actual experience in large and small vessels covering a period of several years.

R. M. PUGSLEY.

YACHTSMEN, AHOY!

LOOK AT OUR SPECIALTIES.

Ground Expressly for Yachts.

"New Jersey"

Producing a Good Sailing Bottom.

Yacht Red Copper Paint

Very Bright.

Yacht Green Copper Paint

Yacht Bright Green Coating

For Wood or Iron Bottoms.

Yacht Black

Ready Mixed and Paste Form.

A very fine black, being very intense in color and of splendid wearing qualities, and does not turn gray.

Yacht White

Ready Mixed for Use.

In offering this preparation to yachtsmen it has been our aim to give them a paint adapted to their use, saving the labor of mixing, and made from such materials as to produce the desired results; not being too glossy or too flat, but of right consistency.

LEADS THEM ALL.
SO OUR TESTIMONIALS SAY.

Send for SAMPLE PAD showing Shades of our

PURE LINSEED OIL READY MIXED PAINTS.

These Paints are well adapted for use on all Club or Boat Houses, as they are not affected by sun, salt water or northern exposure.

MANUFACTURED BY

New Jersey Paint Works

HARRY LOUDERBOUGH, Proprietor,

JERSEY CITY, N. J., U. S. A.

The International Code.

To open communication, hoist the ensign with the code flag under it, which denotes that the International Code is to be used. If the ship has only one code flag, it must be hauled down to be used as an answering pennant.

DISTRESS SIGNALS.

When a vessel is in distress, and requires assistance from other vessels, or from the shore, the following shall be signals to be used or displayed by her, either together or separately.

IN THE DAY TIME.

A gun or other explosive signal fired at intervals of about a minute.

The International Code signal of distress indicated by N C.

The distant signal, consisting of a square flag, having either above or below it a ball or anything resembling a ball.

The distant signal, consisting of a cone, point upwards, having either above or below it a ball or anything resembling a ball.

A continuous sounding with any fog-signal apparatus.

AT NIGHT.

A gun or other explosive signal fired at intervals of about a minute.

Flames on the vessel, as from a burning tar-barrel, oil-barrel, etc.

Rockets or shells throwing stars of any color or description, fired one at a time, at short intervals.

A continuous sounding with any fog-signal apparatus.

SIGNALS FOR A PILOT.

DAY TIME.

Jack at the fore; International Code Signal P T; International Code flag S, with or without the code pennant over it; the distant signal, consisting of a cone point upward, having above it two balls or shapes resembling balls.

AT NIGHT.

Pyrotechnic light, commonly known as a blue light, every fifteen minutes; a bright white light flashed or shown at short or frequent intervals just above the bulwarks for about a minute at a time.

OTHER FLAGS.

A red square flag is a mark of danger, and is displayed by vessels loading, discharging, or having on board powder or some other dangerous explosive.

A yellow square flag belongs to the quarantine service, and is displayed by vessels having contagious disease on board, or is from an infected port and has not been passed by the quarantine authorities.

A white square flag with a blue latin cross, indicates that divine services are being held. This flag is always set above the ensign; a position not occupied by any other flag. During divine services a vessel should not be boarded or spoken unless necessary.

TESTIMONIALS.

Solomons, Md., Sept. 1, 1901.

Mr. Harry Louderbough.

Dear Sir.—I have for several years been in contact with your "New Jersey" Copper Paint, and the results of these many years of observation has proved to me that your "New Jersey" brand is without an equal, being the best protection yet offered for the bottoms of vessels, as an Anti-Fouler. Also its smoothness makes a good sailing bottom.

Yours truly, J. T. MARSH.

Philadelphia, Pa., Oct. 22, 1901.

Mr. H. Louderbough.

Dear Sir.—As Ship Chandlers and Owners & Managers of many vessels, we have sold for many years your New Jersey Copper Paint, and we gladly give it the endorsement it deserves, for it has proved itself to be a reliable Paint, giving a smooth surface; and also a good Anti-Fouling Paint.

JONATHAN MAY & SONS.

Berkley, Va., Oct. 1, 1901.

Mr. Harry Louderbough.

Dear Sir.—Throughout the year I lift at my Railways, quite a number of Vessels in the oyster trade on Chesapeake Bay, and the most popular Paint among this fleet, is your "New Jersey" Copper Paint, for, in the bad fouling waters of our bay it has stood the test. The general expression is that, "It leads them all." L. C. JONES.

Providence, R. I., Nov. 14, 1901.

Mr. Harry Louderbough.

Dear Sir.—At our Dry Dock and Railway, we have for several years applied your "New Jersey" Copper Paint and Yacht Specialties, and found that they were exceptionally well ground, producing a smooth surface, which with their well known Anti-Fouling qualities have given them a popularity.

Very truly, PROV. DRY DOCK CO.

New Orleans, La., Nov 11, 1901.

Mr. Harry Louderbough.

Dear Sir.—After several years of experience in the sales of your "New Jersey" Copper Paint, and Yacht Specialties, they have proved themselves to be without question the best Anti-Fouling Paint that we have ever sold, and our customers give it the same strong endorsement. Yours truly,

J. H. MENGE & SONS, LTD.

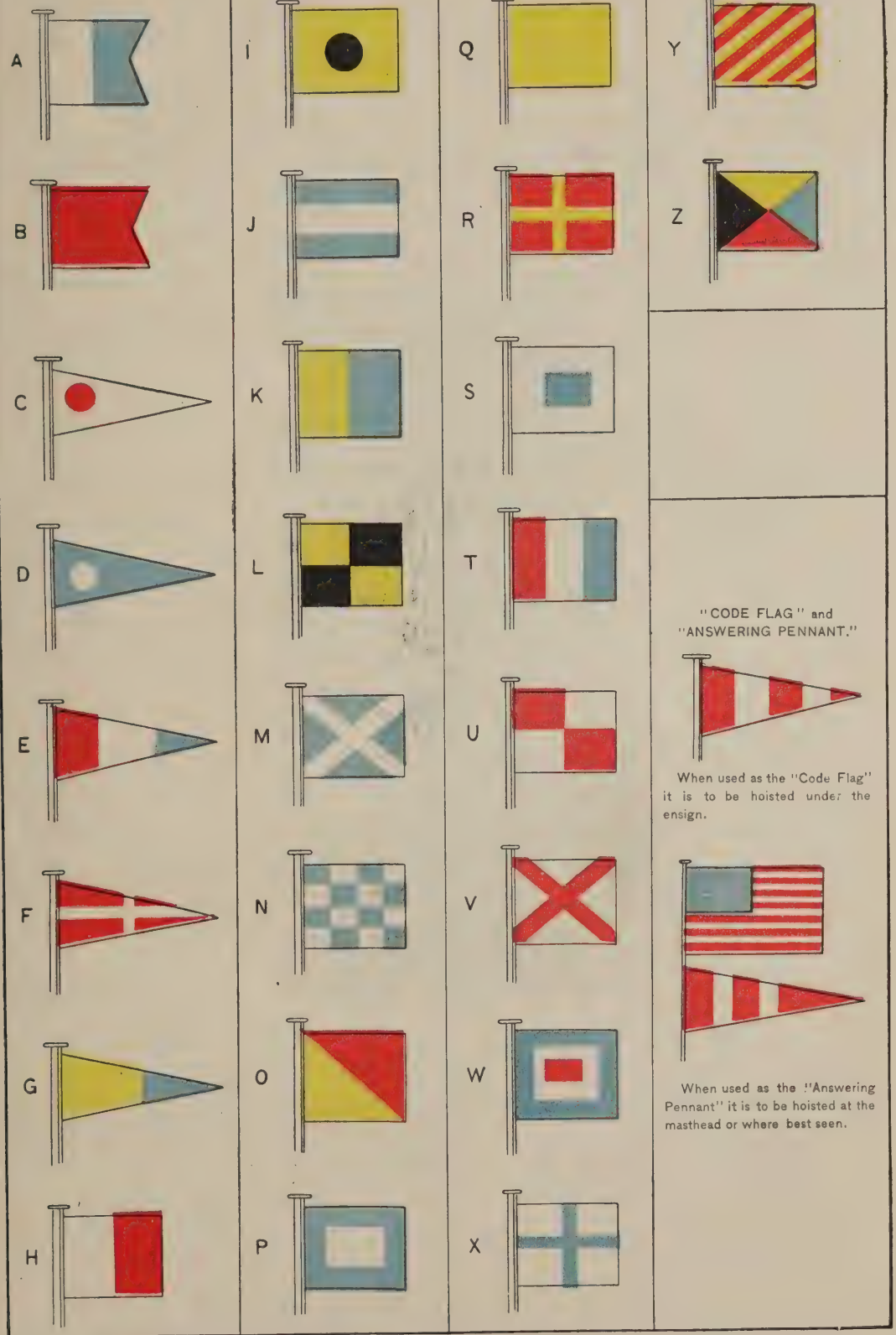
Brooklyn, N. Y., Nov. 11, 1901.

H. Louderbough.

Dear Sir.—Having sold both your Red and Green Yacht Copper Paint for several seasons, I am convinced that it is the most used among the yachtsmen, as I carry no other brand in stock.

Yours truly, FRED. P. HUFF.

FLAGS AND PENNANTS OF THE INTERNATIONAL CODE.



NOTE.—It is desirable, to prevent confusion, that the pennants used should be at least twice as long as the burgees and square flags.

AMERICA'S CUP

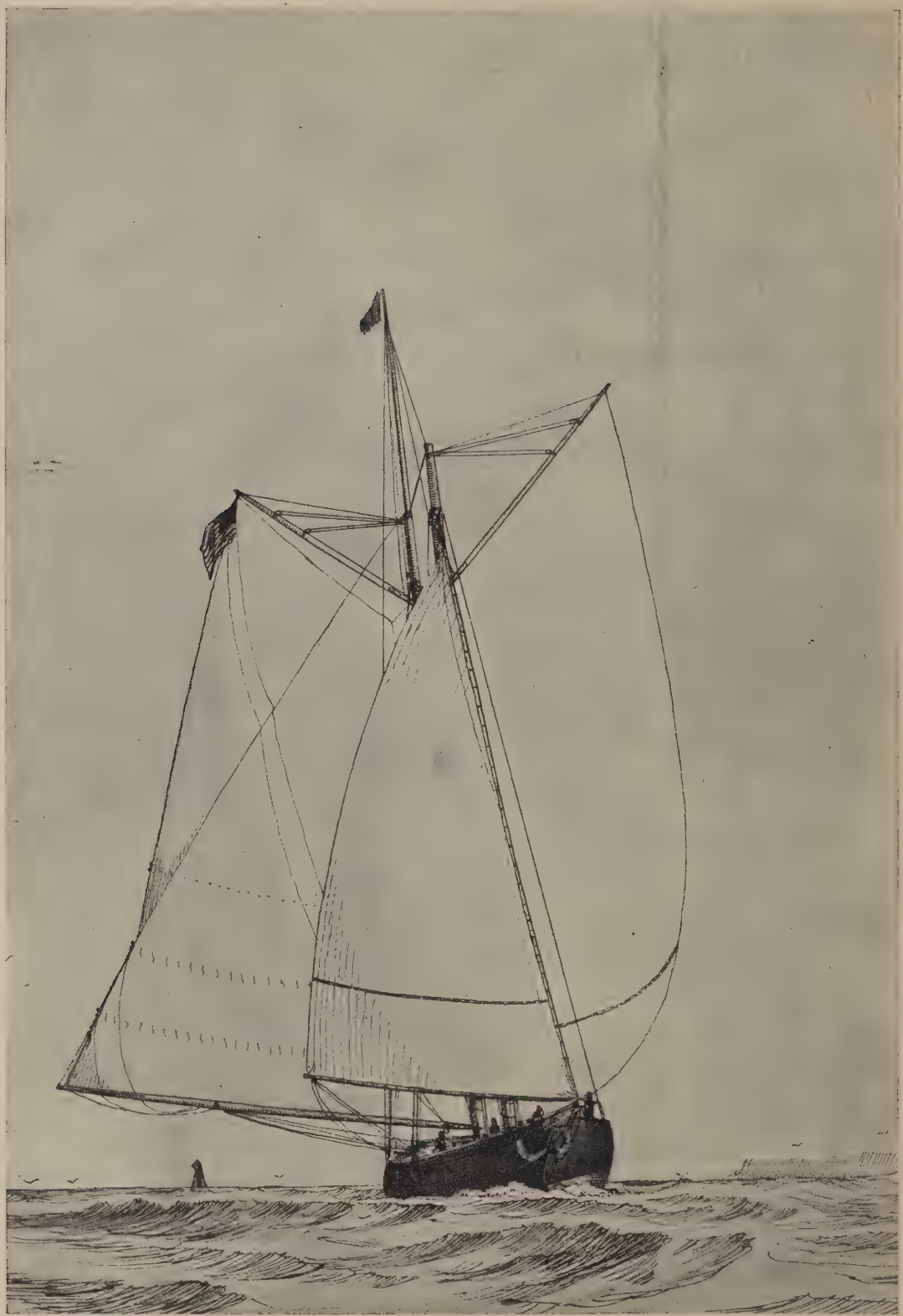
THE AMERICA'S CUP.

This cup was won by the yacht "America" at the regatta of the Royal Yacht Squadron around the Isle of Wight, England, on August 22, 1851. It was offered to and accepted by the New York Yacht Club on July 8, 1857, as a perpetual international challenge cup. Deeded again to them on January 4, 1882, and again on October 28, 1887, and has been held by them since that time.

THE AMERICA'S CUP RECORD OF RACES.

DATE	NAME	OWNER	COURSE	AL'OWS	WINS BY
Aug. 22, 1851	AMERICA..... AURORA.....	G. L. Schuyler..... T. LeMerchant.....	From Cowes around Isle of Wight (AURORA second)	——	M. S. 18.00
Aug. 8, 1870	MAGIC ..... CAMBRIA.....	Franklin Osgood ..... J. Ashbury	N. Y. Y. C. Course (CAMBRIA tenth)	——	39.12.7
Oct. 16, 1871	COLUMBIA..... LIVONIA.....	Franklin Osgood..... J. Ashbury.....	N. Y. Y. C. Course	——	27.04
Oct. 18, 1871	COLUMBIA..... LIVONIA.....	Franklin Osgood..... J. Ashbury.....	20 miles to windward off Sandy Hook Lightship and return	——	10.33¾
Oct. 19, 1871	LIVONIA..... COLUMBIA.....	J. Ashbury..... Franklin Osgood.....	N. Y. Y. C. Course (COLUMBIA disabled)	——	15.10
Oct. 21, 1871	SAPPHO ..... LIVONIA.....	W. P. Douglas..... J. Ashbury.....	20 miles to windward off Sandy Hook Lightship and return	——	33.21
Oct. 23, 1871	SAPPHO ..... LIVONIA.....	W. P. Douglas..... J. Ashbury.....	N. Y. Y. C. Course	——	25.27
Aug. 11, 1876	MADELEINE... COUNTESS OF DUFFERIN	J. S. Dickerson..... Major C. Gifford.....	N. Y. Y. C. Course	——	10.59
Aug. 12, 1876	MADELEINE... COUNTESS OF DUFFERIN	J. S. Dickerson..... Major C. Gifford.....	20 miles to windward off Sandy Hook Lightship and return	——	27.14
Nov. 9, 1881	MISCHIEF..... ATALANTA....	J. R. Busk..... Alex. Cuthbert.....	N. Y. Y. C. Course	——	28.20¼
Nov. 10, 1881	MISCHIEF..... ATALANTA....	J. R. Busk..... Alex. Cuthbert.....	16 miles to leeward from Buoy 5 off Sandy Hook and return	——	38.54
Sept. 14, 1885	PURITAN..... GENESTA.....	J. Malcolm Forbes.... Sir Richard Sutton...	N. Y. Y. C. Course.....	—— 0.28	16.19
Sept. 16, 1885	PURITAN..... GENESTA.....	J. Malcolm Forbes.... Sir Richard Sutton...	20 miles to leeward off Sandy Hook Lightship and return	—— 0.38	1.38
Sept. 9, 1886	MAYFLOWER.. GALATEA.....	Gen. C. J. Paine ..... Lieut. Henn, R. N....	N. Y. Y. C. Course	—— 0 38	12.02
Sept. 11, 1886	MAYFLOWER.. GALATEA	Gen. C. J. Paine ..... Lieut. Henn, R. N....	20 miles to leeward off Sandy Hook Lightship and return	—— 0.39	29.09
Sept. 27, 1887	VOLUNTEER.. THISTLE	Gen. C. J. Paine ..... James Bell	N. Y. Y. C. Course	—— 0.05	19 23¾
Sept. 30, 1887	VOLUNTEER.. THISTLE	Gen. C. J. Paine..... James Bell.....	20 miles to leeward off Scotland Lightship and return	—— 0.06	11 48¾
Oct. 7, 1893	VIGILANT. ... VALKYRIE II..	C. Oliver Iselin *et al.* Lord Dunraven.....	15 miles to windward off Scotland Lightship and return ...	—— 1.48	5.48
Oct. 9, 1893	VIGILANT..... VALKYRIE II..	C. Oliver Iselin *et al.* Lord Dunraven.....	N. Y. Y. C. Course—Equilateral Triangle—30 miles	—— 1.48	10.35
Oct. 13, 1893	VIGILANT .... VALKYRIE II..	C. Oliver Iselin *et al.* Lord Dunraven	15 miles to windward off Scotland Lightship and return	—— 1.33	0.40
Sept. 7, 1895	DEFENDER ... VALKYRIE III.	C. Oliver Iselin *et al.* Lord Dunraven.....	15 miles to windward off Scotland Lightship and return	0 29 ——	8.49
Sept. 10, 1895	DEFENDER.... VALKYRIE III.	C. Oliver Iselin *et al.* Lord Dunraven.....	N. Y. Y. C. Course—Equilateral Triangle—30 miles	0.29 ——	0.47*
Sept. 12, 1895	DEFENDER.... VALKYRIE III.	C. Oliver Iselin *et al.* Lord Dunraven.....	15 miles to windward and return from Sandy Hook Lightship ..	0 29 ——	†
Oct. 16, 1899	COLUMBIA..... SHAMROCK....	C. Oliver Iselin *et al.* Sir Thomas Lipton....	15 miles E. S. E. from Sandy Hook Lightship and return—30 miles ...	—— 0.06	10.08
Oct. 17, 1899	COLUMBIA..... SHAMROCK....	C. Oliver Iselin *et al.* Sir Thomas Lipton....	10 miles Triangular from Sandy Hook Lightship—30 miles ..	—— 0.06	§
Oct. 20, 1899	COLUMBIA..... SHAMROCK....	C. Oliver Iselin *et al.* Sir Thomas Lipton....	15 miles S. by W. from Sandy Hook Lightship and return—30 miles	0.16 ——	6.34
Sept. 28, 1901	COLUMBIA..... SHAMROCK II..	J. Pierpont Morgan... Sir Thomas Lipton....	15 miles to windward and return....	—— 0.43	1.20
Oct. 1, 1901	COLUMBIA..... SHAMROCK II..	J. Pierpont Morgan... Sir Thomas Lipton....	10 miles Triangular—30 miles.....	—— 0.43	3.35
Oct. 4, 1901	COLUMBIA..... SHAMROCK II..	J. Pierpont Morgan... Sir Thomas Lipton....	15 miles to windward and return....	—— 0.43	0.41
Aug. 22, 1903	RELIANCE..... SHAMROCK III	Wm. B. Duncan *et al.* Sir Thomas Lipton...	15 miles to windward and return....	—— 1.57	7.03
Aug. 25, 1903	RELIANCE..... SHAMROCK III	Wm. B. Duncan *et al* Sir Thomas Lipton...	10 miles Triangular—30 miles.....	—— 1.57	1.19
Sept. 3, 1903	RELIANCE .... SHAMROCK III	Wm. B. Duncan *et al.* Sir Thomas Lipton...	15 miles to windward and return....	—— 1.57	‡

*Disqualified for fouling Defender. †Withdrew on crossing the line. §Carried away topmast and withdrew. ‡Reliance finished just within the time limit, Shamrock III did not finish.



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AMERICA WINNING THE QUEEN'S CUP, 1851.

The America.

This famous American yacht not only had the honor of proving herself the fastest vessel afloat by winning the trophy which British yachtsmen have made so many vain attempts to regain, but demonstrated to the whole world that American ingenuity and skill would continue its supremacy in sport as well as in commerce.

Mr. George Steers built the America in 1849 in that part of New York known as Williamsburg. He had constructed several pilot boats and other small craft which became famous the world over for speed; the result being that he was selected to design and build the yacht that won the prize in the most important racing event in the history of yachting. *Her victory brought the attention of many to the most manly of sports, the one requiring the greatest skill, and beyond any doubt, yachting in British and American waters has reached its present high standard as a result. Nothing else could have interested so many wealthy and influential people in the sport.

At the time the America was constructed and at the present time, the center of displacement was well forward of amidships; but Mr. Steers did not believe in such models and built the craft according to theories of his own, which were long lines fore and aft and a uniform displacement along the sides. He built the pilot boat Mary Taylor on those principles and she proved to be a very fast vessel. That and the unusual great dead-rise were the only peculiar or notable features of the craft which gave the British the greatest surprise since the days of Paul Jones.

The syndicate for whom the yacht was built was composed of J. C. Stevens, Edwin A. Stevens, Hamilton Wilkins, J. Beekman Finlay, and George L. Schuyler, all prominent yachtsmen and members of the New York Yacht Club.

That the America would be in the race of August 22, 1851 did not disturb the minds of British yachtsmen at all. When she arrived at Cowes, she had just proved her sailing qualities by beating badly the British yacht Laverock in an impromptu brush outside the harbor.

Commodore Stevens made a strong effort to get a race with some British yacht, but met with no success, as his vessel had in the meantime beaten several of the best British yachts in as many off-hand brushes. She was of little or no interest at first; but her speed being demonstrated on so many occasions, she began to be looked upon as an unknown quantity and finally as a dangerous rival, and therefore no race could be arranged.

The Commodore then posted a challenge in the Royal Yacht Squadron's Castle to sail the America against any British vessel of any size or tonnage for from one thousand to ten thousand guineas in a six-knot breeze. As this challenge was not accepted, it seems to indicate that British yachtsmen had lost what confidence they had in their fastest vessels and become convinced of the superiority of the America over anything they had in the way of fast yachts. As it was impossible to arrange for a race, Commodore Stevens decided to enter the schooner in the free-for-all race. This came off on August 22, 1851. The start was made from Cowes at 10 A. M., the whole fleet was at anchor when the signal to start was given. The American crew then showed their superior qualities as seamen by heaving up their anchor and setting all sail in an instant.

The yachts which started were: The three-masted schooner Brilliant, 392 tons; schooner Constance, 218 tons; schooner Wyvean, 205 tons; cutter Alarm, 193 tons; schooner Beatrice, 161 tons; schooner Gypsie Queen, 160 tons; cutter Arrow, 84 tons; cutter Mona, 82 tons; cutter Bacchante, 80 tons; schooner Ione, 75 tons; cutter Freak, 60 tons; cutter Eclipse, 50 tons; cutter Volanthe, 48 tons; cutter Aurora, 47 tons; and the America, which, according to the entry list, was 170 tons, making a total of fifteen yachts in the race.

The America soon showed her heels to the fleet, and at one time she was so far ahead that not a sail was visible from her decks; but the wind died down and she had to contend with a strong contrary tide, and the current not having reached the other yachts, they soon came in sight. After passing St. Catherine the wind had freshened, and the America, with lifted sheets, soon showed her heels the second time and arrived at Cowes a winner at 8.37 P. M. The next yacht to come in was the cutter Aurora, which arrived at 8.55 P. M. The America's time was 10 hours 37 minutes, in which time she covered a distance of about 55 miles.

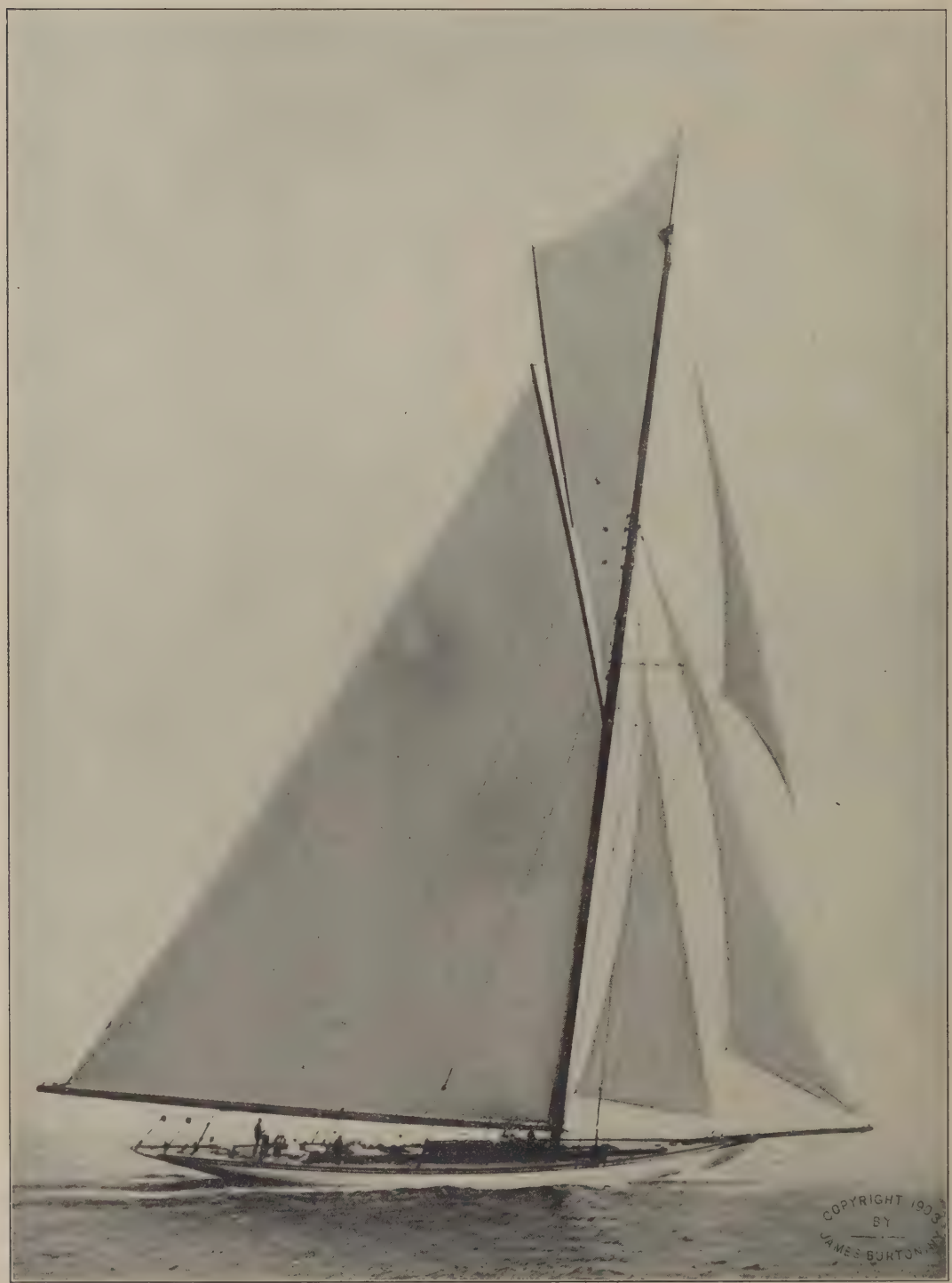
The only accidents of importance was the grounding of the cutter Arrow at St. Catherine and the loss of the America's jib-boom. The Arrow had no chance of winning, so her grounding did not matter, and the Americans cleared away the wreckage resulting from the loss of the jib-boom in a moment, and without jeopardizing her chances to win.

That the America had proven herself faster than any other craft in British waters at that time was conceded by yachtsmen generally; but some contended that they could build a yacht in a few weeks that would beat her. Then Commodore Stevens offered to wait until the boat was completed and race the America against her for $125,000.00. No one met this offer and the boat was not built, so British yachtsmen had not only lost confidence in their best boats, but in their skill to build one that would beat the America.

The British fleet did not relish the idea of being beaten, but it had the good effect of spurring them on, which greatly benefited them.

After the race a cartoon was published in Punch representing two boys—John and Jonathan—sailing toy boats, and Jonathan saying to John, "If you don't look sharp, I'll show you how to make a seventy-four next!"

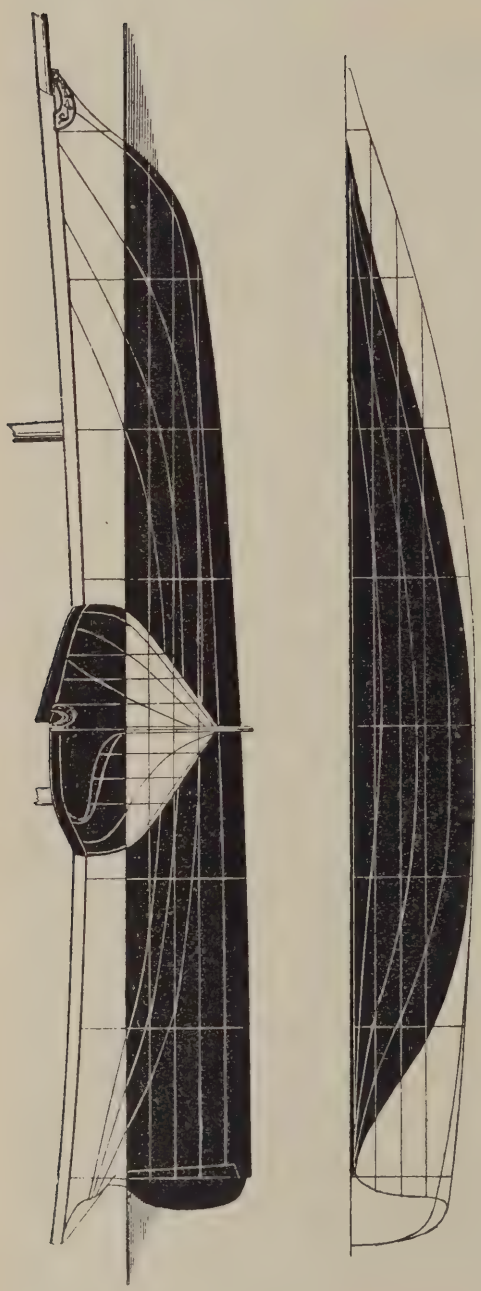
*She was rigged precisely like a pilot boat of that day, with a single jib, a big foresail, and no fore topsail: she had neither jib-boom, fore topmast or fore-boom. Dimensions of hull: length on deck, 94 feet; on water line, 88 feet; on keel, 82 feet; beam, 22 feet 6 inches; depth of hold, 9 feet 3 inches; draught of water, 11 feet 6 inches.



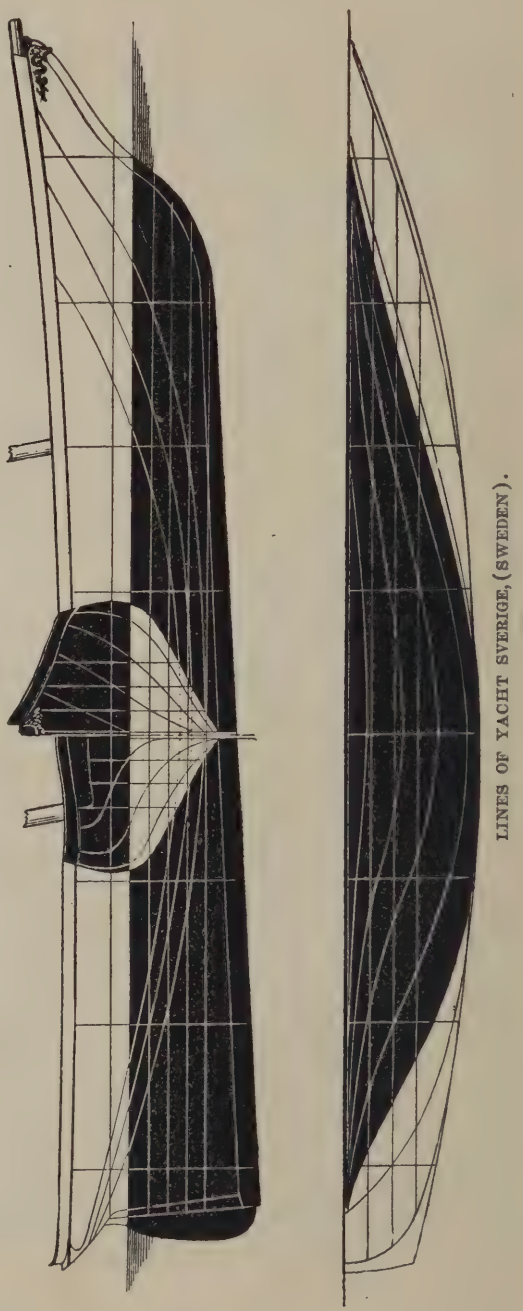
SHAMROCK III

Copyright 1903, by Jas. Burton, N. Y.

RELIANCE



LINES OF YACHT AMERICA



LINES OF YACHT SVERIGE, (SWEDEN).

The Rudder.

SVERIGE, BUILT IN SWEDEN TO SAIL AGAINST THE AMERICA.

THE SWEDISH SCHOONER YACHT SVERIGE.

This remarkably fast schooner was built at Essinger, Sweden, by Carl A. Anderson in 1852. She bears a strong resemblance to the America, which she raced off the Isle of Wight on October 12th of that year, outsailing the former for a long distance, but finally lost the race by the breaking of the jaws of her gaff. The general appearance of the two boats is so similar that we may assume that the designer of Sverige has at least taken his inspiration from the American pilot boats, which have retained the same general type before and for a time after America. The dimensions of Sverige were: length over all, 113 feet 10 inches; load water line, 96 feet; beam, extreme, 25 feet 8 inches, load water line, 24 feet 8 inches; draught, 11 feet 8 inches; displacement, long tons, 149.5; area, midship section, square feet, 102.

On the page opposite, the lines of both yachts, Sverige and America, are shown for comparison.

"The Rudder."

SIR THOMAS JOHNSTONE LIPTON

The Rudder

THE BUCENTAUR.

In the twelfth century Venice, as the ally of Pope Alexander III., was engaged in war with the Emperor Frederick Barbarossa. Her Doge, Sebastian Ziani, in command of the fleet of the republic, met and defeated the Emperor's son, Ottho, in a fierce engagement on the Adriatic. In gratitude for the assistance thus rendered, and to perpetuate the memory of the service, the Pope devised and enjoined the ceremony—the yearly wedding of the sea, in token of the naval supremacy of Venice. To add pomp to the ceremony, the republic ordered a magnificent vessel to be constructed; this craft was called the Bucentaur. On Ascension Day the Doge, accompanied by his senators, the Papal Nuncio, and the Ambassadors of the Powers, was rowed out of the city, a fleet of gondolas surrounding the barge and making a gorgeous spectacle of maritime powers and civic splendor. On reaching the open sea, the Doge cast a ring into the water, and pronounced the sentence: *Despousamus te, Mare, in signum veri perpetuique dominii.* In 1797, when the French, under Napoleon, took Venice, his soldiers, more rapacious than a horde of vandals, destroyed the vessel, in order to obtain the gold with which she was ornamented. They are said to have obtained over $100,000 worth of the metal. A model of the Bucentaur is to be seen in the arsenal.

AMERICA, CRACK PRIVATEER OF THE WAR OF 1812

Four ships called "America" were owned by the firm of Geo. Crowninshield & Son of Salem, Mass. The first ship of that name was a prize captured during the Revolutionary War by the noted Salem privateer "Grand Turk" and brought into Salem on April 3d, 1783. The second and third ships of that name were French vessels. The fourth "America" (shown above), was built in 1803-4 at Salem by Mr. Retire Becket, her career as a privateer commenced Nov. 24th, 1813, and ended about a year later; during that time she made many valuable captures.

The Hull and Rig of Vessels.

The term rig, when applied to vessels, generally refers to the number and kind of masts and style of sails that are carried, but the term is also sometimes used indiscriminately to designate the class of hull or the complete vessel in her entirety. Thus it may be said of a vessel that she has a ship's hull with the rig of a brig, meaning that the hull may be of a build that does not correspond with the style of rig. In such cases the rig prevails over the hull in giving the name of the vessel's species, and she is called a brig; but in some compound names, as "scow-schooner," the word "scow" expresses the build of hull and the word "schooner" the style of rig.

A gradual change resulting from the inventions and improvements made during the past century has been going on in the rig of American vessels as well as in those of other countries. Some new rigs have been found to be better adapted to some waters, and changes have been made to suit the increased size of vessels, which have proved to be more serviceable in certain trades.

But while old rigs have been abandoned and new ones added, the names applied to them have not in all cases been uniform throughout the country.

Some localities may adopt certain rigs as more desirable for certain trades, but it is important that they should be designated by the same nomenclature at all the ports. While recognizing the styles of rig where best known and adopted, in order to counteract any tendency to use local names, more especially for new rigs, a brief description of those most generally known and acknowledged is inserted here.

SHIP.

Aside from the generic name of ship, which applies to all species of vessels, we have the term applied to the rig of the largest class of sailing-vessels, which has for a long period been known among sailors to designate a three-mast vessel having lower masts, topmasts, and topgallant masts with yards (square rigged) on each mast, and having a bowsprit.

The term "lofty ships" was formerly applied to all classes of square-rigged vessels.

When the large, modern merchant ships began to be built the double topsail rig (which was an American invention) was introduced, and more latterly the four-mast ship, now quite common, for the long iron ships built in Great Britain. The ship carrying four masts is generally fore-and-aft rigged on the after mast.

BARK.

The bark or barque (from the Latin barca) is a rig similar to that of the ship, excepting that it has only fore-and-aft sails (no yards) on the mizzen mast.

Barks are commonly smaller than ships, although some vessels of 1,000 to 1,500 tons are so rigged for the sake of economy. They carry double topsails.

BARKENTINE, ALSO SPELLED BARKANTINE AND BARQUANTINE.

The term is derived from the word "barque," and properly signifies a small bark.

The barkentine is fitted with three masts, square-rigged with yards on the foremast only, and fore-and-aft sails on the main and mizzen masts.

Barkentines are generally constructed with great length in proportion to their breadth, and on the lakes are built to suit the peculiar navigation of those narrow waters.

BRIG

According to Admiral Smyth, this word is from the Celtic, and was first applied to ferry-boats, meaning "passage over the water." The brig is now a two-mast square-rigged vessel. There are several kinds of brigs:

(1) The full-rigged brig, which is a rig nearly similar to that of the snow of former times, having fore and main lower masts, topmasts, and topgallant masts, and yards on each, with or without a square mainsail, and carrying also a trysail.

(2) The hermaphrodite or half brig, which is a vessel with a brig's foremast and a schooner's mainmast, square-rigged forward and fore-and-aft rigged aft.

BRIGANTINE.

This word, which is probably a diminutive of "brig," is employed in the French to designate the fore-and-aft mainsail used in small vessels.

The brigantine rig (or brig-schooner) is similar to the hermaphrodite, excepting that brigantines carry a light topsail on the mainmast above the large fore-and-aft mainsail. The term is variously applied by seamen of different European nations to a peculiar sort of vessel of their own marine. At some ports on the Pacific coast a hermaphrodite brig rigged with a large three-cornered mainsail without a gaff, but an overlapping fore-and-aft topsail whose sheet hauls out to the boom, is improperly called a brigantine. The brigantine rig is becoming quite rare in American waters.

SCHOONER.

A name applied to vessels of fore-and-aft rig of various sizes. Schooners have two or more long lower masts without tops, and are sometimes fitted with light square topsails, especially at the fore; but these are giving way to the fore-and-aft gaff topsails, which are better adapted to the American coast.

The schooner used to be the rig chiefly for small vessels, but some of the more modern schooners measure 2000 and 3000 tons, and carry six and seven masts.

SLOOP.

The sloop is a vessel with only one mast, and a bowsprit carrying a fore-and-aft mainsail and jib, which, being set on the forestay, is called the foresail. The sloop is one of the oldest styles of vessel known to the trade of this country, and is (with some local variations in the cut of sails) a rig that is more or less employed in the commerce of the entire globe.

CUTTER.

A small sloop-rigged vessel, sharp built, with a straight bowsprit running out parallel with the deck, and having large sails. She carries a fore-and-aft mainsail, stay foresail, flying jib, and topsail. Large cutters, 400 to 500 tons, have been constructed for naval use and made to carry yards with every sail that can be set on one mast, even to sky sails, moon-rakers, star-gazers, etc. The modern cutter-yacht generally carries a flying gaff topsail. The name cutter applies as much to the sharp build of the vessel's hull as to the particular rig.

LUGGER.

Luggers are vessels generally with one mast (though sometimes two or three), having quadrilateral or four-cornered fore-and-aft sails bent to a hoisting yard, the luff being about two thirds the length of the after leech. The French chasse-maree or lugger, used for fishing and coasting purposes, carries two or three masts and is of 200 to 300 tons capacity. In this country the lugger is generally a small vessel with one mast, used for the oyster trade on the Mississippi River and adjacent waters.

LATEEN.

The lateen rig is similar to the lug rig, excepting that the sail is triangular, a long yard which hoists obliquely to a stout mast forming the luff.

The lateen rig is much used by small craft in the Mediterranean and in some of the larger size which have more than one mast. The sails brail up in case of need.

In New Hampshire, and waters in that vicinity, there is a long, shallow boat decked the entire length and having a "cuddy" or small cabin. This vessel, which is flat-bottomed and uses a lee board, is called a gondola (gundlow) and carries a large picturesque lateen sail hoisted on a yard sometimes 60 to 70 feet in length. On the Pacific coast the lateen rig is in common use for pleasure craft and small fishing vessels.

SCOW.

The scow is a vessel used in the shoal waters of nearly all the States, but principally on the lakes.

Scows are built with flat bottoms and square bilges, but some of them have the ordinary schooner bow. They are fitted with one, two, and three masts, and are called scow-sloop or scow-schooner, according to the rig they carry. Some of them carry bowsprits. The distinctive line between the scow and regular-built schooner is, in the case of some large vessels, quite obscure, but would seem to be determined by the shape of the bilge; the scow having in all cases the angular bilge instead of the curve (futtock) bilge of the ordinary vessel.

CAT.

A rig supposed to be derived from the Brazilian catamaran that allows of one sail only, an enormous fore-and-aft mainsail spread by a boom and gaff and hoisted to the one mast stepped near the stem. The cat rig is much employed on Long Island Sound for small coasting and fishing-vessels. It is also a favorite rig for pleasure-vessels, being easily handled, but is not suited to a heavy sea and rough weather.

SHARPIE.

A vessel of 20 to 40 feet in length, used by the oystermen of Connecticut and New Jersey, and also for general pleasure purposes. The sharpie is built sharp, with a flat bottom, and carries a center-board. The rig of the sharpie is peculiar and the vessel might be termed a cat-rigged schooner. The Ohio sharpie, used on the lakes for fishing purposes, has the same rig, excepting that they generally carry gaffs.

YAWL.

The yawl is properly a ship's boat, resembling the pinnace. It is more commonly propelled by oars, but there is a certain rig applied to them by a British customs act known as the yawl rig, and in use by some American as well as foreign yachts.

It resembles the cutter rig, except that it has a jigger-mast at the stern, which carries a small lug-sail, the main boom traversing just clear of it; many small fishing-boats on the lakes now have this rig.

CATAMARAN.

A pleasure boat constructed on the plan of the vessel of that name used on the Brazilian coast. The American catamaran has a double hull and carries the cat rig. The catamaran of the Madras and Ceylon coasts is made of three logs 20 to 30 feet long, 2 to 3 feet apart, secured by spreaders and lashings. They carry large sails and are very fast sailers.

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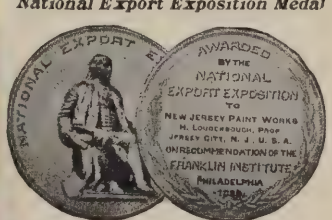

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CLIPPER SHIP "YOUNG AMERICA."

The Celebrated Clipper Ship "Young America."

This country became renowned for its extraordinary fast wooden clipper ships during the years between 1845 and 1865, before steamships had taken the wind out of sails, and the fastest of all these Yankee clippers was the world-renowned Young America, built in New York by America's great wooden shipbuilder, William Henry Webb, for George Daniels and associates of New York. The builder of this ship was the founder of Webb's Academy and Home for Shipbuilders, at Fordham Heights, N Y. He is spoken of as the "Grand Old Man" of American shipbuilding.

One of the features of this ship that every sailor will readily notice, is that she has only a single mizzen topsail, containing three reefs, while the fore and main topsails are double. Capt. E. C. Baker, ex-Superintendent of the United States and Brazil Steamship Company, commanded the Young America when she made some of her fastest passages. Capt. Baker was very proud of his ship and often spoke of her wonderful sailing qualities. Other friends and admirers were Jabez Howes and John Rosenfeld, both of San Francisco, to whom she once belonged.

About the year 1888, the Young America was sold to an Austrian firm who changed her name to the Miroslav; shortly afterward the ship left Philadelphia with a cargo of oil, bound for Fiume, France, and was never afterward heard from. Thus ended the career of the fastest wooden ship in the world. A full-rigged model of this ship is in the possession of J. D. Spreckels & Bro., of San Francisco, who prize it above money. Dimensions: Length on deck, 235 feet; beam, moulded, 40 feet 2 inches; depth of hold, 25 feet 9 inches; tonnage, o. m. 2300 tons; n. m. 1439 tons; built expressly for the California & East India trade in 1853. Her mainmast was 207 feet in length. She sailed on a voyage from New York to San Francisco, from 50 degrees of latitude in the Atlantic Ocean to 50 degrees of latitude in the Pacific Ocean, in six consecutive days. She made a trip from Frisco to New York in 83 days, the fastest on record; New York to Liverpool, 18 days; Liverpool to Melbourne, 81 days; Callao to Queenstown, 74 days; Glasgow to Otago, New Zealand, 88 days; Otago to Callao, 36 days; San Francisco to Hong Kong, 47 days; Manila to New York, 98 days. She beat the American ships Invincible and David Crockett and the British clipper Thermopylae on several occasions. The Young America once made 15 knots an hour for 80 hours while under command of Capt. Horace T. Bader of West Yarmouth, Mass. One of her commanders was the late Capt. David S. Babcock, who was afterward President of the Providence and Stonington Line, and the father of W. I. Babcock, General Manager of the Chicago (Illinois) Shipbuilding Company. George Howes of New York said he never saw a more beautiful ship than the Young America; she had a counter like a pilot boat. A good drawing of the Young America will be found in Webb's Work on Shipbuilding, by Wm. H. Webb.

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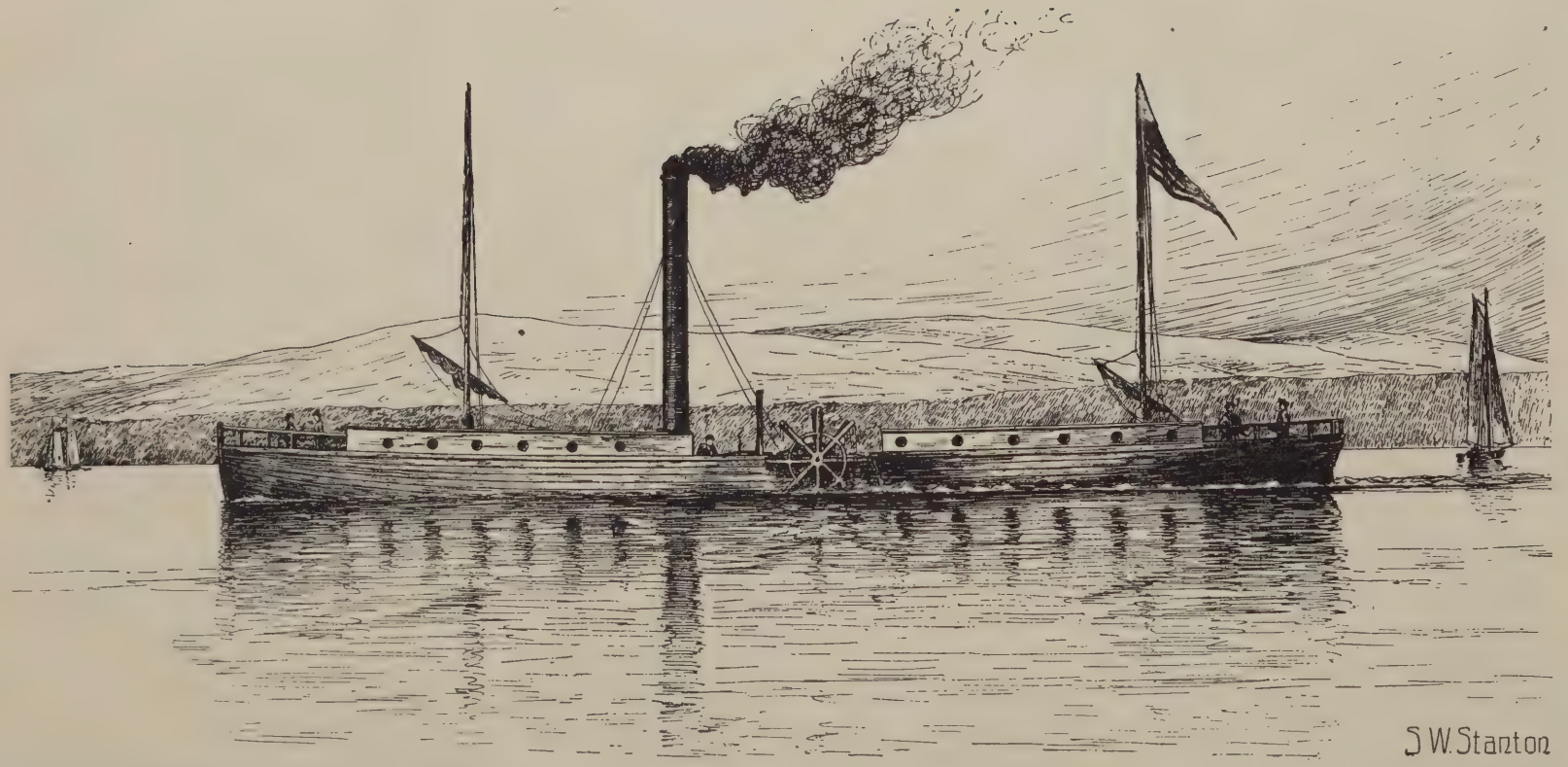

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ROBERT FULTON'S CLERMONT, THE WORLD'S FIRST SUCCESSFUL STEAMBOAT.

Built in 1807 in New York, and ran for a number of years on the Hudson River. Length, 133 feet; beam, 18 feet; and depth of hold, 7 feet. Engine 24 inch cylinder by 4 feet stroke. One copper boiler, 20 feet long by 3 feet broad. Speed, 4 miles per hour.,

From "American Steam Vessels," Copyrighted.

THE PRISCILLA, LARGEST AND FINEST INLAND STEAMBOAT EVER BUILT.

Running on Long Island Sound. Length, 440 feet; beam, 52½ feet, (over guards 93 feet); depth of hold, 20½ feet; draft of water, 12½ feet. Speed, 22 miles an hour. Accommodation for 1500 passengers. Cost, $1,500,000.

THE PIONEER TRANSATLANTIC S. S. "SAVANNAH."

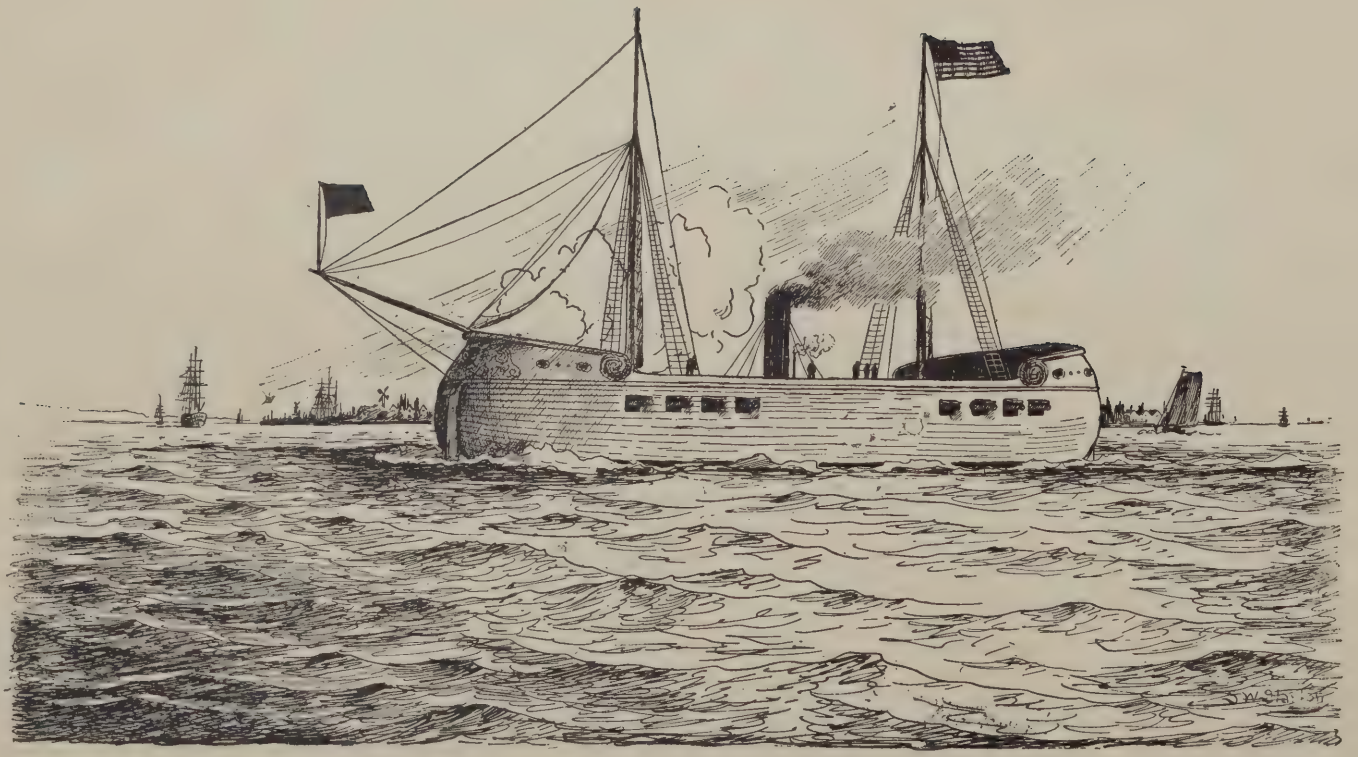
Built at Corlears Hook on the East River, New York City, and launched on Aug. 22, 1818. She was intended to be used as a sailing packet between New York and Liverpool, but was purchased before being finished by Wm. Scarborough & Co., of Savannah, Ga., and fitted with machinery. The paddle wheels were enclosed in canvas, held in place by iron rims, and were so constructed that in stormy weather they could be folded up and placed on deck. Her model was considered fine, and her passenger accommodations elegant. In 1819, she went from Savannah to Liverpool, Eng., in 22 days, being the first transatlantic steamship.

Scientific American.

Length, 630 feet. Beam, 73 feet. Displacement, 37,000 tons on a draft of 36½ feet. Speed, 15 knots.

THE "MINNESOTA," THE LARGEST STEAMSHIP EVER BUILT IN AMERICA.

The "Minnesota" was built in New London, Conn., for the Pacific trade, to run in connection with the Great Northern Railroad. The most remarkable feature of this ship is her great depth, though when she is light she draws less than 20 feet of water. She was designed to meet the special requirements of the Oriental trade and one of her hatches is sufficiently large enough to enable a locomotive to be loaded complete in her hold. While her length and breadth are less than those of the Great Eastern, she has a greater displacement.



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THE DEMOLOGOS, OR "FULTON THE FIRST." PIONEER STEAM WAR VESSEL.

Built in New York in 1814, under the supervision of Robert Fulton. Length 156 feet, beam 56 feet, and depth 20 feet. Was practically a double boat, with boiler in one hull and engine in the other, with center well for the working of the paddle wheel, so placed as to be out of harm's way. Made successful trip to sea, and afterwards laid up in Brooklyn, until 1829, when she was accidentally blown up.

Copyright 1902, by C. McKnight Smith.

UNITED STATES FIRST CLASS BATTLE SHIP "NEW JERSEY."

The "New Jersey" is one of the 15,300 ton battleships, and is a sister ship to the Virginia, Nebraska and Georgia. Her length is 435 feet, beam 76 feet 10 inches, mean draught 24 feet, 19,000 horse power. She carries four 12-inch guns, four 8-inch guns, twelve 6-inch guns, twelve 3-inch 14-pounder quick-fire guns, twelve 3-pounder quick-fire guns, four 1-pounder quick-fire guns, and submerged torpedo tubes. Her speed is 19 knots.

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THE "JERSEYMAN," THE FIRST STEAM FERRYBOAT.

This boat was built by Robert Fulton on July 2, 1812, and started on her trips between New York and Jersey City 15 days later. She made the trip in about 14 minutes. She was built of two boats, each 80 feet long, 10 feet beam and 5 feet deep in the hold, boats being 10 feet apart, thus forming a deck 80 feet long by 30 feet wide, propelling waterwheel being between the two boats to protect it from injury by ice and shocks on entering the dock. The whole of the machinery between the two boats, leaving 10 feet of deck on each side, both ends being alike, and each end having a rudder she never put about, and continued in service for many years.

The Erie Railroad ferryboat "Arlington" was built in 1904 by the Burlee Dry Dock Co., of New York City; she is 224 feet long, 43 feet 6 inches beam, 16 feet 5 inches depth, 1600 horse power, speed 15 miles per hour.

She has several novel features; five water-tight bulkheads, with doors near the deck so that the boat cannot sink even if the doors were left open, she is provided with cross settees in the cabin, passengers sitting back to back, also retiring rooms for women.

The Rudder.

WOLVERINE, THE LATEST AND LARGEST ICE YACHT IN THE WORLD

She carries 776 square feet of sail and belongs to the Shrewsbury Ice Yacht Club fleet. She was built in 1903 and as yet has had very little chance to show her ability, she has made 20 miles in 1 hour, 16 minutes and 12 seconds.

The Nautical Gazette.

THE PAUL JONES, NEW THIS SEASON, LARGEST OCEAN TUGBOAT FLYING THE AMERICAN FLAG.

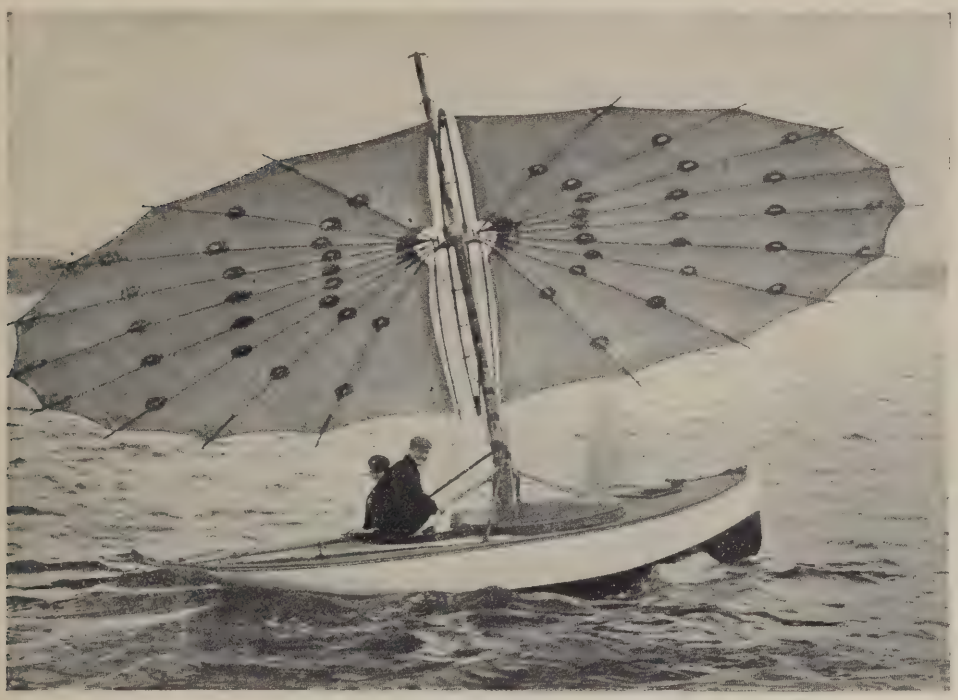
We give herewith a brief description of the new and largest sea going tugboat "Paul Jones." The hull is 192 ft. in length over all, 180 ft. between perpendiculars, 36 ft. molded beam, 21 ft. 2 in. molded depth at side, and 20 ft. 6 in. depth of hold. Under ordinary conditions, with 600 tons of coal on board, the draft is 18 ft. and the displacement 2,120 tons. The freeboard amidships is 5 ft. The hull is built of oak and yellow pine, the frame and planking being of oak. The keel is 12x14 in., and the frames, averaging 8 in. thick, and molded 14 to 7 in., are spaced 24 in. centers. The deck beams are 14x14 in., and are spaced 30 to 36 in. The stem is 14x16 in., and the stern post 21x21 in. The outside planking is all oak, 4 in. thick. The deck planking is 3x4 in. The gross tonnage is 945 and net tonnage 545. There are two distinct decks in the hull forward and aft of the machinery and boiler space. The hull was built in the shipyard of the Thames Tow Boat Co., at New London, and was launched in September, 1903.

A 1600-horse-power engine is used to drive the vessel. It was constructed in the shops of the Neafie & Levy Ship & Engine Building Co., Philadelphia, Pa. It is of the triple expansion type, having cylinders 21, 33 and 55 in. in diameter by 36-in. stroke, to which steam is supplied by two Neafie & Levy Scotch-type boilers, of steel, each 12 ft. long by 14 ft. diameter, built for a pressure of 180 lbs. to the sq. in. There are three Morison corrugated furnaces, 51 in. in diameter, in each boiler. There is also a donkey engine, 9 ft. high by 4 ft. in diameter. A complete electric plant has been installed on board, including a 4,000-candle power searchlight. The propeller wheel is four-bladed, of iron, 14 ft. 6 in. in diameter. The masts are two in number and are each 75 ft. long. The Jones has a speed of 16 knots.

"The Rudder." Photo by N. L. Stebbins.

THE GLOUCESTERMAN

FISHING SCHOONER METAMORA



PILCHER AND WILSON'S CYCLONE SAIL ON AN "UMBRELLA" BOAT.

Pilcher and Wilson's Umbrella Sail.

The old saying "there is nothing new under the sun," would seem to be denied by the new umbrella sail which is causing such excitement and enthusiasm among boat and small sail yacht owners and captains in Great Britain. Our illustration shows a boat sailing with a cyclone sail. This boat has been very conspicuous at Cowes and in the Solent during the past season, and is chiefly interesting in that she is the first vessel in which the umbrella idea has been worked out in a practical way. The chief feature of the cyclone sail, which is practically a large umbrella, is that the wind pressure on it has no effect whatever to incline the boat. Roughly speaking, the pull of the sail is at right angles to its mean surface, that is to say, in the direction of the mast. In other words, it may be described as a kite held by a rigid string. If the mast were stepped quite on the lee side of the boat, it is evident that the sail would lift the lee side and so list the boat to windward; and if the mast were stepped on the weather side, lifting the weather side of the boat, it would necessarily list the boat to leeward. It follows then that there is some certain point which happens to be slightly on the lee side of the centre line at which, if the mast is stepped, there will be no tendency for the wind to careen the boat at all. When actually sailing in the boat, the only way in which one is aware of a puff of wind is by noticing that the boat travels faster, and experiencing a slight sensation similar to that coming from the acceleration of the engines in a steamer. For sailing with the wind in different directions to the boat the whole mast and sail are rotated by means of a turn-table to which the mast is attached, and the mast is elevated and lowered by means of two tackles. There is also a balance-weight which helps to elevate the mast and balance its dead weight. Experiments with the cyclone sail are being made by P. S. Pilcher, of 75 Victoria street, S. W., London, and Walter G. Wilson, of Blackrock, County Dublin, Ireland, who hope soon to make arrangements for placing smaller sails of the same type on the market, for use in skiffs, canoes, boats and yachts. The sail in the illustration measures thirty feet horizontally and sixteen feet up and down. The boat is seventeen feet on the water line. She is an old boat which Mr. Wilson has had for several years, and in no way designed to carry the sail. With an ordinary rig 200 square feet of canvas was rather too much for the boat, but she is able to carry this sail with 360 square feet, and consequently sails much faster. A new light boat specially adapted to it is now being built by John I. Thornycroft & Co., of Chiswick, London, for G. Selwyn Edwards, of Newbury, Ireland, who is interested in its development. The umbrella sail, we might add, is also utilized as an awning.

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SIX-MASTED SCHOONER ADDIE M. LAWRENCE OF THE WINSLOW FLEET.

The new type of six-masted schooner can no longer be called an experiment, but a practical and successful vessel. One of the latest acquisitions to the fleet is the Addie M. Lawrence, built in Bath, Me., and launched in December, 1902; she is one of the largest wooden sailing vessels in the world. She has a length of 292.4 feet on keel, 48.3 feet beam, 22.3 feet depth of hold; her gross tonnage is 2860 and she has a carrying capacity of 4700 tons of coal, and her sail area is 8700 yards. She has five discharging hatches, each 12x16 feet, on the main deck and a complete steam equipment for handling the ship and cargo. Her cabin is furnished in fine style, woodwork being quartered-oak, mahogany and cypress, furniture being leather upholstered.

Evolution of the Schooner.

The schooner was an American idea and today the handsomest fleet of vessels in the world is owned on the Atlantic coast. From the two-master, of 100 tons burden, in 1714, to the seven-master, of 8000 tons capacity, in 1902, is an increase that no other class of vessels can boast of.

The following table shows the increase by years:

1714—First two-masted, fore and aft vessel, ever constructed in the world, built at Gloucester, Mass., by a Captain Andrew Robinson. She was an innovation on anything ever before seen in the rig of a vessel, incidentally giving Andrew Robinson much perplexity as to its designation. On the day of the launching, happily for the builder and the world at large, the problem was solved by a bystander, who observed, as she slid into her home, "How she schoons!" "If she schoons, she must be a schooner," remarked the builder.

1849—First three-masted schooner ever constructed, the Zachary Taylor, built at Hanover-street wharf, Philadelphia, by Matthew Vandusen, for Captain James A. Mershon, father of Charles Mershon, the Walnut-street shipbroker. Her mizzenmast mast was much shorter than the other masts. She loaded a cargo of cars, engines, machinery, small boats, etc., for Chagres, a port near where Aspinwall is now located. She ran for two years and was lost in the Delaware Bay. She was about 250 tons register and carried 375 tons of cargo.

1849—Second three-masted schooner, the Spray, built at Wilmington, Del., for Captain Isaac Cathcart. She had a long mizzenmast, just as the present three-masters have. She loaded for California and was sold out there.

1866—Largest two-masted schooner, the Oliver Ames, 456 tons register, built at Berkeley, Mass.

1880—First four-masted schooner, the W. L. White, built at Bath, Me., by Goss Sawyer, and Packard for Jacob B. Phillips of Taunton, Mass. She registered 995 tons gross, and was the largest vessel of her class at that time in the world. She was a four-master by accident, for she was originally designed for three masts, but it was thought that they would be too unwieldy, and so the fourth mast was added.

1881—Second four-masted schooner, the Francis C. Yarnall, built at Wilmington, Del.

1882—First schooner over 1000 tons register, the Ellicott B. Church, built at Bath, Me. She registered 1137 tons and was a four-master.

1882—Second schooner over 1000 tons register, the Augustus Hunt, built at Bath, Me. She registers 1200 tons. Is still afloat and has four masts.

1884—Largest three-masted schooner ever constructed: built at Kennebunk, Me., the Bradford C. French, 968 tons gross.

1884—First schooner over 1300 tons register, built at North Weymouth, Mass. She was the Haroldine, 1361 tons register and was a four-master.

1886—Second schooner over 1300 tons register, built at Bath, Me. She was the Sarah W. Lawrence, 1369 tons register and had four masts.

1887—First schooner over 1600 tons register, built at Bath, Me., the T. A. Lambert, 1630 tons register; she had four masts.

1888—First five-masted schooner, the Governor Ames, built at Waldoboro, Me., 1778 tons register.

1896—First schooner over 1800 tons register, built at Bath, Me., the William B. Palmer, 1805 tons register; has four masts.

1897—First schooner over 2000 tons register, built at Bath, Me., the Frank A. Palmer, 2014 tons register and up to date is the largest four-master ever built.

1898—Second five-masted schooner, the Nathaniel T. Palmer, built at Bath, Me., 2440 tons register.

1899—Third five-masted schooner, the John B. Prescott, built at Camden, Me., 2454 tons register.

1900—First schooner over 2600 tons register, the William C. Carnegie, built at Bath, Me., 2663 tons register. Largest five-master ever built.

1900—First six-masted schooner, built at Camden, Me., the George W. Wells, 2970 tons gross register.

1900—Second six-masted schooner, the Eleanor A. Percy, built at Bath, Me., 3401 tons register.

1901—The first seven-masted schooner contracted for by the Crowley boys of Taunton, Mass., to be built of steel and ready for business early in 1902 to carry 8000 tons of coal.

THE GREATEST OF THEM.

The following table will give the names and gross tonnage of some of the largest schooners in the world:

Thomas W. Lawson, 7m	5218
Eleanor A. Percy, 6m	3401
George W. Wells, 6m	2970
A. M. Lawrence, 6m	2860
Baker Palmer, 5m	2792
William C. Carnegie, 5 m	2663
Rebecca Palmer, 5m	2556
W. L. Douglas, 6m	2470
John B. Prescott, 5m	2454
Nathaniel T. Palmer, 5m	2440
Oakley C. Curtis, 5m	2374
Helen W. Martin, 5m	2265
Fannie Palmer, 5m	2258
Louise B. Crary, 5m	2231
Arthur Seitz, 5m	2207
Martha P. Small, 5m	2178
Mary W. Bowen, 5m	2153
Van Allens Boughton, 5m	2129
M. D. Cressy, 5m	2114
Frank A. Palmer, 4m	2014
Jennie French Potter, 5m	1993
Marie Palmer, 4m	1904
Mary F. Barrett, 5m	1833
James W. Paul, Jr., 5m	1808
Henry O. Barrett, 5m	1807
William B. Palmer, 4m	1805
Governor Ames, 5m	1778
Jacob M. Haskell, 4m	1778
S. P. Blackburn, 4m	1756

System of Buoyage Adopted in United States Waters.

In approaching a channel from sea, red buoys with even numbers will be found on the starboard side of the channel, and must be left on the starboard hand in entering.

Black buoys are on the port side of the channel, and must be left on port hand in entering.

Buoys marking obstructions are painted with red and black horizontal stripes and may be left on either hand.

Buoys marking mid-channel are painted with white and black perpendicular stripes and must be passed close to, that danger may be avoided.

Buoys with perches, balls, cages, etc., mark turning points, the color and number indicating the hand they are to be left on.

Nun buoys are red with even numbers, and are to be left on the starboard hand in entering.

Can buoys are black with odd numbers and are to be left on the port hand in entering.

When buoys are lighted, those with red lights are to be left on the starboard hand and those with white lights on the port hand in entering.

Day beacons, stakes and spindles when placed on sides of channels, are colored like buoys, and when lighted at night, they are to be left the same as lighted buoys.

Bell and whistling buoys are usually placed to mark certain points, and their use is explained in the buoy book for the district.

There are numerous day marks which are constructed and distinguished with special reference to the locality in which they are placed, a description of which is usually given in the buoy book for the district.

White buoys are usually employed to mark anchorages, dumping grounds, etc., and as a rule, are explained in the U. S. Coast Pilot.

Yellow buoys are sometimes employed by the quarantine authorities to mark a station.

A SPANISH BACK LABEL.

Pinturas de Cobre

UN CASO NOTABLE.

EL grabado es copia de la fotografía de un trozo de madera del cual uno de los extremos fué pintado con la **PINTURA DE COBRE DE LA CIUDAD DE JERSEY,** manufacturada por Harry Louderbough, propietario de la FABRICA DE PINTURAS DE NEW JERSEY, en la ciudad de Jersey, N. J., y conservado en el agua por espacio de cinco meses en Port Royal, S. C. Sobre el extremo sin pintura se ven los estragos causados por el gusano de agua salada, tan destructivo para la madera, y el gran número de caracoles á ella adheridos. Obsérvese el extremo pintado con la **PINTURA DE COBRE DE NEW JERSEY** y su espléndida condición.

Este trozo de madera fué puesto por mí en el agua en Port Royal, S. C., por espacio de cinco meses. Después de ese tiempo el extremo pintado salió tan limpio como antes de sumergirse.

MILLS EDWARD,
Cap. del pailebot "Florence Shay."

PINTURA DE COBRE
DE
NEW JERSEY.

de New Jersey.

ESPECIALIDADES
DE NUESTRAS
Pinturas para Marina.

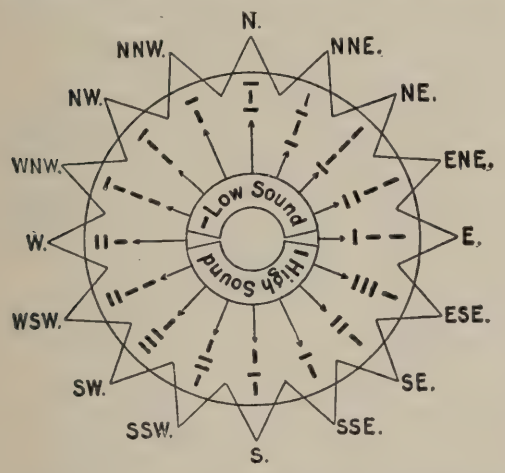
NEW JERSEY

- PINTURA de COBRE.
- PINTURA roja de COBRE para yats.
- PINTURA ELÁSTICA para calafate.
- NEGRA para YATS.
- BLANCA para YATS.
- PINTURA para mástiles.
- PINTURA para chimeneas.
- PINTURA para cascos y cubiertas.

El Instituto Americano de Nueva York acordó á nuestra New Jersey Pintura de cobre, Pintura para calafate y Pintura preservativa para pilotes, una medalla, el premio más elevado que fué concedido.

Another Fog Signal Device

The contrivance illustrated herewith is intended to determine the direction of vessels in fog and is the invention of Captain Basroger of the French steamer Stepherd Worms. The signal is given by a whistle of whistles emitting two sounds, one in a very high key, the other very low. These sounds, adapted to the sixteen



principal points of the compass, signal the exact direction in which the vessel is going. In the diagram the high key is represented by a vertical dash and the low key by a horizontal dash, the diagram being read in the direction of the arrows. If a ship is going north it gives a low, a high, and a low whistle; if it is going west-northwest it gives three high whistles and one low or deep whistle. All the signals from north to south by way of the east begin with a deep or coarse whistle, and all those from the north to the south by way of the west begin with a high or keen whistle. Arrangements tell the principal direction of the vessel by the first sound that strikes the ear.

The instrument proper consists of a box containing a cogged drum which, somewhat after the manner of the keys in a wind instrument, determines whether the sound be high or low. A retarder, controlled by a crank, causes the rotation of the drum, so that two sounds can not be blended or confused. The crank turns once every second. In sailing vessels the signals are produced by bells.

The Boatswain's Call.

On yachts carrying a good-sized crew the boatswain's call or whistle should be employed for the transmission of orders. The following simple code embraces all that is necessary for the boatswain to understand of this detail of yachting discipline:

The Call of Attention.—A long, straight pipe. This precedes a verbal order, such as "All hands on deck!" etc.

To Call Away a Boat.—Same as the "call of attention," and followed by the verbal order: "Away gig;" "Away dingy;" "Away cutter;" "Away lifeboat," etc.

The Call to Meals.—Three long, rolling pipes.

To Heave Away or to Pull.—A series of moderately short, straight pipes.

To Belay.—Two short, quick chirps, followed by a moderately short, rolling pipe.

To Pipe the Side.—A prolonged, straight pipe. The boatswain stands facing the gangway, his "call" held to his lips with his left hand, while his right hand is held to his cap in salute.

To Make Colors.—Two short, quick chirps, followed by a long, rolling pipe.

To Make Sunset.—Same as to "make colors."

To Pipe Down.—One long, straight pipe, followed by a long rolling pipe.

NEW JERSEY
Aluminum Enamel
READY MIXED
A very durable and handsome finish for enameling
RADIATORS,
STEAM, WATER OR GAS PIPES,
BATH TUBS,
BRIC-A-BRAC, Etc.
Also for Wood or Iron, Inside or Outside.
Put up in half pint, pint, quart, half gallon and gallon cans.

To Mark a Lead Line.

The hand lead has nine marks and eleven deeps, and is marked to twenty fathoms, as follows:

2 fathoms, two strips of leather.
3 fathoms, three strips of leather.
5 fathoms, white cotton rag.
7 fathoms, red woolen rag.
10 fathoms, leather with one round hole.
13 fathoms, blue woolen rag.
15 fathoms, white cotton rag.
17 fathoms, red woolen rag.
20 fathoms, leather with two round holes.

The deep sea lead is marked the same as the hand lead up to twenty fathoms and from there it is marked every five fathoms with one knot, and every ten fathoms with two knots up to one hundred fathoms which is marked with a piece of leather.

Some marks are woolen rags and some are cotton rags that they may be distinguished at night by putting the mark in the mouth.

A lead line should be of the same material as is used for log lines, and must be thoroughly wet when marked.

Table for Correcting Soundings.

This table is used for correcting soundings for the height of the tide above mean low water. The first column contains the range of the tide in feet. The other columns give the height of the tide above low water, corresponding to each hour.

Range of tide in feet.	Hours from High or Low Tide.					
	1	2	3	4	5	6
2	0.0	0.5	1.0	1.5	2.0	2.0
4	0.2	1.0	2.0	3 0	3 8	4 0
6	0.4	1.5	3.0	4 5	5 6	6.0
8	0 5	2.0	4.0	6.0	7 5	8.0
10	0.7	2.5	5.0	7.5	9 3	10 0
12	0.8	3 0	6.0	9 0	11.2	12.0
14	0.9	3 5	7.0	10.5	13 1	14.0
16	1.1	4.0	8.0	12.0	14 9	16 0
18	1.2	4.5	9.0	13.5	16 8	18.0
20	1.3	5.0	10.0	15.0	18.7	20 0
22	1.5	5.5	11.0	16 5	20.5	22 0
24	1.6	6.0	12.0	18.0	22 4	24 0
26	1.7	6.5	13 0	19.5	24 3	26 0
28	1.9	7.0	14.0	21.0	26 1	28 0
30	2.0	7.5	15 0	22.5	28.0	30.0
32	2.1	8.0	16.0	24 0	29.9	32 0
34	2.3	8.5	17.0	25.5	31.7	34 0
36	2.4	9.0	18.0	27.0	33 6	36 0
38	2.5	9.5	19.0	28.5	35 5	38.0
40	2.6	10.0	20.0	30.0	37 4	40 0

Example: At a place where the depth of water as shown by the chart is three fathoms at mean low water, what will the depth be at two hours after low water? Range of tide, eight feet.

Depth given on the chart, 3 fathoms	18 feet.
Correction from table for 2 hours and 8 feet +	2 "
Ans.	20 feet.

Example: At high water a cast of the lead gave a depth of twenty-four feet. What will the depth be at four hours after high water? Range of tide, twelve feet.

Sounding	24 feet.
Correction from table for 4 hours and 12 feet —	9 "
Ans.	15 feet.

TESTIMONIALS.

Elizabeth City, N. C., February 25, 1891.
Mr. H. Louderbough.

Dear Sir.—Having used and sold your New Jersey Copper Paint at my Railway ever since you first introduced it to the trade, and never having heard a complaint against it, it affords me pleasure to add my testimonial to the many you have already received, to the effect that all who wish to keep worms out, and have a clean, smooth sailing bottom on their boats, will do well to use New Jersey Copper Paint.

Very truly yours, E. S. WILLEY.

Chincoteague, Va., Oct. 10, 1901.
Mr. H. Louderbough.

Dear Sir.—I can cheerfully testify to the good merits of your very popular brands of "New Jersey" Brown Copper Paint, and "New Jersey" Yacht Red Copper Paint. Even in the very bad fouling waters of our bay it has made for itself, in competition with other paints, a splendid reputation, and I have good endorsements from those who purchase from me year after year.

Yours truly,
W. N. CONANT.

Signals to the Engine Room.

When engines are stopped, one bell means—AHEAD SLOW.

When engines are working ahead slow, jingle bell means—FULL SPEED AHEAD.

When engines are working full speed ahead, one bell means—SLOW DOWN.

When engines are working ahead slow, one bell means—STOP.

When engines are stopped, two bells means—ASTERN SLOW.

When engines are working astern slow, jingle bell means—FULL SPEED ASTERN.

When engines are working astern either slow or full speed, one bell means—STOP.

When engines are working full speed ahead, four bells mean—ASTERN. With jingle bell, FULL SPEED ASTERN.

Handling Steam-Vessels.

The helm should never be put hard over when the ship is running full speed unless it is absolutely necessary, the effect being an enormous strain on the engines and rudder, which has been known to result in blowing off cylinder heads, breaking the shaft, damaging the rudder, etc. The greatest strain is with a port helm. This danger varies with the speed of the ship.

When a ship starts from an anchorage or a dock, full speed should not be expected at once, because the engines must be warmed and the water worked out before they can be driven.

When it is intended to stop or slow the ship, as in entering port or coming to an anchor, and when the ship must go through shoal water, the chief engineer should have at least an hour notice if possible, as such information is invariably of value to him.

Engines working ahead, throw the stern to starboard; and when working astern, throw the stern to port.

When running, the propeller sets the ship to starboard of her course and is called the set of the screw. It then follows that a ship will make more leeway on the port tack than when on starboard tack.

To bring a ship to a full stop when running full speed ahead, put the helm hard to port and at the same time reverse the engine to full speed astern; but never expect the engines to work astern as fast as they do ahead.

In making a sharp turn to port in a river or bay, bring the ship to a full stop near the turning point and then work the engine full speed ahead with starboard helm. To make the turn to starboard, run full speed till near the turning point, and then work the engine full speed astern with port helm.

TWIN SCREW.

In a twin-screw ship it is seldom necessary to work the engines full speed and in opposite directions, and it should never be done if possible to avoid it, as it subjects the machinery and hull to an unusually great strain and generally does more or less damage. The ship can be handled by working one engine at a time.

The starboard propeller has the same effect as in a single-screw ship, and the port one has the opposite.

Bell Time on Shipboard.

Time, A. M.	Time, A. M.	Time, A. M.	Time, P. M.	Time, P. M.	Time, P. M.
1 Bell....12.30	1 Bell.....4.30	1 Bell.... 8.30	1 Bell....12.30	1 Bell.....4.30	1 Bell.... 8.30
2 Bells... 1.00	2 Bells....5.00	2 Bells... 9.00	2 Bells... 1.00	2 Bells....5.00	2 Bells... 9.00
3 " ... 1.30	3 " 5.30	3 " ... 9.30	3 " ... 1.30	3 " 5.30	3 " ... 9.30
4 " ... 2.00	4 " 6.00	4 " ...10.00	4 " ... 2.00	4 " 6.00	4 " ...10.00
5 " ... 2.30	5 " 6.30	5 " ...10.30	5 " ... 2.30	5 " 6.30	5 " ...10.30
6 " ... 3.00	6 " 7.00	6 " ...11.00	6 " ... 3.00	6 " 7.00	6 " ...11.00
7 " ... 3.30	7 " 7.30	7 " ...11.30	7 " ... 3.30	7 " 7.30	7 " ...11.30
8 " ... 4.00	8 " 8.00	8 " .. Noon	8 " ... 4.00	8 " 8.00	8 " Midnight

On shipboard, for purpose of discipline and to divide the watch fairly, the crew is mustered in two divisions, the Starboard (right side, looking toward the head) and the Port (left). The day commences at noon, and is thus divided: Afternoon Watch, noon to 4 P. M.; First Dog Watch, 4 P. M. to 6 P. M.; Second Dog Watch, 6 P. M. to 8 P. M.; First Watch, 8 P. M. to Midnight; Middle Watch, 12 A. M. to 4 A. M.; Morning Watch, 4 A. M. to 8 A. M.; Forenoon Watch, 8 A. M. to noon. This makes seven Watches, which enables the crew to keep them alternately, as the Watch which comes on duty at noon one day has the afternoon next day, and the men who have only four hours' rest one night have eight hours the next. This is the reason for having Dog Watches, which are made by dividing the hours between 4 P. M. and 8 P. M. into two Watches. Time is kept by means of "Bells," although sometimes there is but one Bell on the ship.—Whitaker.

Loading Table.

Seven and one-half gallons of pure fresh water weighs 62 pounds and 8 ounces, and if a ship is loading in fresh water, she must take on board a certain quantity of cargo after the ship reaches her usual draught. This quantity can be determined by the table, as the following example shows.

Example: A ship draws 19 feet in sea-water. In fresh water she was loaded to that draught with 3750 tons. How much more cargo must she take to be fully loaded?

Under	3,000	tons	and	opposite	62	lbs.	8	oz.	75. tons.
"	500	"	"	"	62	"	8	"	12.50 "
"	200	"	"	"	62	"	8	"	5.00 "
"	50	"	"	"	62	"	8	"	1 25 "
Additional cargo required to finish loading —									93.75 "

In case the water is not fresh, but brackish, it is only necessary to find the weight of 7½ gallons of the water, and enter the table with it in the same manner as in the above example, to get the quantity of cargo required to finish loading.

Weight of 7½ gallons water in pounds and ounces	TONS OF CARGO IN SHIP WHEN SALT WATER DRAUGHT IS REACHED.															
	50	100	200	300	400	500	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
62 8	1.25	2.50	5.00	7.50	10.00	12.50	25.00	50.00	75.00	100.00	125.00	150.00	175.00	200.00	225.00	250.00
62 9	1.20	2.40	4.80	7.20	9.60	12.00	24 00	48.00	72.00	96.00	120 00	144.00	168.00	192.00	216.00	240.00
62 10	1.15	2.30	4.60	6.90	9.20	11.50	23.00	46.00	69.00	92.00	115.00	138.00	161.00	184.00	207 00	230.00
62 11	1.10	2.20	4.40	6.60	8.80	11.00	22.00	44.00	66.00	88.00	110.00	132.00	154.00	176.00	198 00	220.00
62 12	1.05	2.10	4.20	6.30	8.40	10.50	21.00	42.00	63 00	84.00	105.00	126 00	147.00	168 00	189.00	210.00
62 13	1.00	2.00	4.00	6.00	8.00	10.00	20.00	40.00	60.00	80.00	100.00	120.00	140.00	160.00	180 00	200.00
62 14	.95	1.90	3.80	5.70	7.60	9.50	19.00	38.00	57.00	76.00	95.00	114.00	133.00	152.00	171 00	190 00
62 15	.90	1.80	3.60	5.40	7.20	9.00	18.00	36.00	54.00	72.00	90.00	108.00	126.00	144 00	162.00	180.00
63 00	.85	1.70	3.40	5.10	6.80	8.50	17.00	34.00	51.00	68.00	85.00	102.00	119.00	136.00	153.00	170.00
63 1	.80	1.60	3.20	4.80	6.40	8.00	16.00	32.00	48.00	64.00	80.00	96.00	112.00	128.00	144.00	160 00
63 2	.75	1.50	3.00	4.50	6.00	7.50	15.00	30.00	45.00	60.00	75.00	90.00	105.00	120 00	135.00	150.00
63 3	.70	1.40	2.80	4.20	5.60	7.00	14.00	28.00	42.00	56.00	70.00	84.00	98.00	112.00	126.00	140.00
63 4	.65	1.30	2.60	3.90	5.20	6.50	13.00	26.00	39.00	52.00	65.00	78.00	91.00	104.00	117.00	130.00
63 5	.60	1.20	2.40	3.00	4.80	6.00	12.00	24.00	36.00	48.00	60.00	72.00	84.00	96.00	108.00	120.00
63 6	.55	1.10	2.20	3.30	4.40	5.50	11.00	22.00	33.00	44.00	55.00	66.00	77.00	88.00	99.00	110.00
63 7	.50	1.00	2.00	3.00	4.00	5.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00
63 8	.45	.90	1.80	2.70	3.60	4.50	9.00	18.00	27.00	36 00	45.00	54.00	63.00	72 00	81.00	90 00
63 9	.40	.80	1.60	2.40	3.20	4.00	8.00	16.00	24.00	32.00	40.00	48.00	56 00	64.00	72 00	80.00
63 10	.35	.70	1.40	2.10	2.80	3 50	7.00	14.00	21.00	28.00	35.00	42.00	49 00	56 00	63.00	70.00
63 11	.30	.60	1.20	1.80	2.40	3.00	6 00	12.00	18.00	24 00	30.00	36.00	42.00	48.00	54.00	60.00
63 12	.25	.50	1.00	1.50	2.00	2.50	5.00	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00
63 13	.20	.40	.80	1.20	1.60	2.00	4.00	8.00	12.00	16.00	20.00	24.00	28.00	32.00	36.00	40.00
63 14	.15	.30	.60	.90	1.20	1.50	3.00	6.00	9.00	12.00	15.00	18.00	21.00	24.00	27.00	30.00
63 15	.10	.20	.40	.60	.80	1.00	2.00	4.00	6.00	8.00	10.00	12.00	14.00	16.00	18.00	20 00
64 00	.05	.10	.20	.30	.40	.50	1.00	2.00	3.00	4.00	5 00	6.00	7.00	8.00	9 00	10.00
64 1	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.....	.....	.....

"NEW JERSEY" Best Spar Varnish

FOR VESSELS AND YACHTS.

When applied to Marine Outside Work or Store Fronts it presents a heavy body, resisting sun and weather and is not easily affected by salt water or severe exposure.

Stowage of Cargo.

Before any cargo is put into the ship, the hold must be cleaned and the limbers, water courses, scuppers and pump wells cleared. For general cargo dunnage is required as follows: 14 inches in the bilges, 3 inches in the sides and 2 inches between decks. In the hold the dunnage is placed fore and aft and athwartships in between decks.

Tar, resin, oil and other cargo of like nature should be stowed under dry cargo to prevent damage in case of leaky barrels.

Spirits and valuable cargo of such nature as are usually tempting to dishonest persons, should be stowed in such place as is not accessible during the voyage.

Casks should be stowed fore and aft, bilge and cantline, bung up and bilge free. Barrels are constructed with their head pieces vertical when they are bung up. The bung and rivets in the hoops are always in line.

Bales should be stowed on their flat amidship with marks and numbers up, and on their edge in the wings with marks and numbers inboard.

In stowing cases, the side bearing the mark is termed the top and should be stowed that side up.

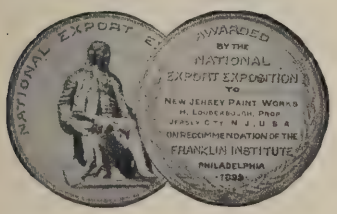
Rails, pig iron and like cargo should be stowed in such manner as not to have too much of it in the bottom of the ship, as it will cause her to labor very heavily. A rough rule is to put two thirds of it in the lower hold and the balance in between decks and tom it down. This rule will apply to some vessels, while in others it is quite different.

Acids should be stowed on deck and in case of breakage they must be thrown overboard if possible.

When working cargo, the ship must be kept on an even keel.

Never disturb damaged cargo until it has been surveyed.

"New Jersey"



Bemerkenswerthe Thatsache.

Dieser Schnitt ist eine photographische Abbildung von einem Brett, welches auf der einen Seite angestrichen war mit **New Jersey Kupfer-Farbe,** fabrizirt von Harry Louderbough, Eigenthümer der **New Jersey Farben-Fabrik,** Jersey City, N. J., U.S.A., und welches in Port Royal, S. C., fünf Monate im Wasser gelegen hat. Auf der andern Seite sieht man den Schaden welcher der Salzwasser-Wurm am dem unangestrichenen Holz verursachte, wie auch die Masse Entenmuscheln, die sich daran angesetzt haben. Man beachte die Seite, wo **New Jersey Kupfer-Farbe** angewandt wurde, sie ist unbeschädigt.

Das hier repräsentirte Brett legte ich in Port Royal, S. C., fünf Monate in's Wasser. Die angestrichene Seite war nach dieser Zeit so gut erhalten geblieben, als wie sie zuvor war.

Mills Edward,
Kapitän vom Schooner „Florence Shay".

Schutz-Marke.

New Jersey
Kupfer-Farbe.

Kupfer - Farbe.

Unsere Marine-Farben

Spezialitäten:

New Jersey
- **Kupfer-Farbe,**
- **Rothe Kupfer-Farbe,** Für Yachts,
- **Elastische Saum-Farbe,**
- **Schwarze Yacht-Farbe,**
- **Weiße Yacht-Farbe,**
- **Mast-Farbe,**
- **Schiffs-Kamin-Farbe,**
- **Schiff- und Deck-Farbe.**

Das "American Institute" von New York zeichnete uns mit der höchsten Medaille aus für unsere New Jersey Kupfer-Farbe, Saum-Farbe und Pfahl-Präservirungs-Farbe.

Finding a Ship's Speed.

Frequently it is of some importance to know the exact speed of a ship at such times when the only opportunity to obtain it is from a short run. The following method is available for any run, no matter how short.

Rule—Note the interval of time and the distance run. Then multiply the distance run by the number of minutes in one hour and divide the product by the number of minutes in which the run was made. The result will be the speed per hour.

Example: A ship run from Sandy Hook Light Ship to Scotland Light Ship in 21 minutes. What was her rate of speed per hour?

Distance run 4⅛ miles = 4'.125
Minutes in 1 hour = × 60
Minutes run =21)247.500(11'.78 Speed per hour.

```
21
---
37
21
---
165
147
---
180
168
---
12
```

Table for finding capacity in gallons and tons for water tanks.

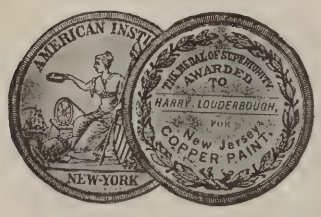
1 Cubic foot of water	=	62.50	pounds.
1 " " " "	=	7.50	gallons.
1 Gallon " "	=	8.33	pounds.
1 Quart " "	=	2.08	"
1 Pint " "	=	1.04	"
1 Gill " "	=	0.26	"

Example: A tank is 10 feet in length, 5 feet in breadth, and 4 feet in depth. How many gallons of water will it hold and how much will the water weigh?

10 × 5 × 4 = 200 cubic feet

Cubic feet	200	Cubic feet	200
Gallons to 1 cubic foot	× 7.5	Pounds to 1 cubic foot	62.5
Capacity in gallons	1500.0	6¼ tons	=12500.0

Ans.—The tank will hold 1500 gallons of water, which will weigh 12500 pounds, or 6¼ tons.



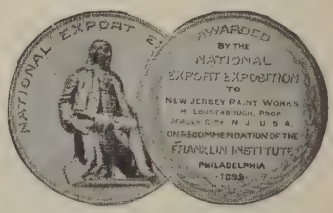
北、圖：ニューヨーク洲ジョンレー市ニューヨンレーペイント會社ヲ主ハリー、ルドーボー氏製造ニューヨンレー赤銅ペイントヲ部、塗リ五ヶ月間南カロリナ洲ポートローヤルニ落水中ニ沈メ置キタル木板ノ寫眞ハタルニカノヨリ此ノペイントノ塗用サヘ他ノ部、海水ニ浸ルト全ク腐朽シ無數ノ貝ヲ附着スルヲ見ルベシ

ニューヨンレー赤銅ペイントハ塗用シタル部分ガ僅少ノ損傷ヲモ生ズルヲ禁ジ、往視セヨ

古ヨリ証明ス

フローレンス、シェーロン船長
ミルス、エドワード

TRADE MARK.
NEW JERSEY
COPPER PAINT.



船舶用ユニバーサル銅ペイント
遊船用白色ペイント
遊船用黒色ペイント
帆檣用ペイント
煙突用ペイント
甲板底用ペイント

ニューヨンレー市ニ設ケタル米國製造品ニシテ、最高ノ優賞牌ヲ贈リ附セリ

Speed and Revolutions.

It is often convenient to know how many revolutions are required to give a ship a certain speed. For various reasons, ships are slowed for a number of hours. Then it is usually desired that she will arrive at a certain point at some particular time, and if she runs a trifle too fast it becomes necessary to slow to steerage way, stop or stand off and on, which, in some cases, is attended with more or less danger. Therefore, it is important that the vessel be slowed to the proper speed at first. This is done by the following method: First determine the coefficient for the propeller, which is found by the formula:

$$\text{Coefficient} = \frac{\text{pitch} \times 60}{6080}$$

Example: The pitch of a propeller is 24 feet 6 inches. What is the coefficient?

Pitch 24 ft. 6 in. = 24.5
Minutes in 1 hour = × 60
Feet in 1 nautical mile 6080)1470.0(.2417
12160
25400
24320
10800
6080
47200
42560
4640

The coefficient in this case is .242 and the speed of the ship per hour is found by the formula:

Speed per hour = Revolutions per minute × coefficient.

Example: The coefficient is .242 and the revolutions 89 per minute. What is the speed per hour?

Coefficient = .242
Revolutions per minute = 89
2178
1936
21.538

In case it is necessary to reduce the speed of this ship to 12 knots, the number of revolutions per hour would be found by the formula:

$$\text{Revolutions} = \frac{\text{speed per hour desired}}{\text{coefficient.}}$$

Example: The speed desired is 12 knots per hour. The coefficient is .242. What number of revolutions are required?

.242)12.0000(49.5
968
2320
2178
1420
1210
210

Then 49.5 revolutions per minute will drive the ship 12 knots per hour. However, it must be remembered that the slip must be considered in every case, and as it varies from about 5% to 20%, it can only be determined by observation. Then the wind and sea must be considered.

The slip is determined by the formula:

$$\text{Slip} = \frac{\text{dist. by obs.} \sim \text{dist. by wheel}}{\text{dist. by wheel.}}$$

Example: Distance run by wheel 363 miles and by observation 340 miles. What was the percentage of slip made?

Distance by wheel = 363 miles
Distance by obs. = 340 "
Whole slip made = 23 "
363)23.00(.063
2178
1220
1089
131

Percentage of slip made = .063 or 6 3-10%.

Practical Measurements.

TO FIND THE

Area of a triangle—multiply the base by half the altitude.

Area of a circle—multiply the square of the radius by 3.1416.

Circumference of a circle—multiply the diameter by 3.1416.

Diameter of a circle—divide the circumference by 3.1416.

Surface of a sphere—multiply the area of a great circle of the sphere by 4.

Volume of a sphere—multiply the surface by one-third of the radius.

Volume of a cask—to the head diameter add two-thirds of the difference between the head and bung diameters and multiply the area by the inside length.

TESTIMONIALS.

Rockland, Me., February 2, 1891.

H. Louderbough.

Dear Sir.—We have used the New Jersey Copper Paint at our yard, and were much pleased with its finess. It being easy to apply and of good covering qualities has convinced us that it is a superior Paint.

I remain, yours, &c., G. A. GILCHRIST.

Brooklyn, February, 13, 1891.

H. Louderbough.

Dear Sir.—We have successfully used the New Jersey Copper Paint, and must say the trade has been very much pleased with the results. It being very fine, and its good body, has convinced us that it is the best Copper Paint in the market.

I remain, yours, &c., F. COSHING & CO.

Baltimore, February 20, 1891.

Mr. H. Louderbough, Jersey City, N. J.

Dear Sir.—We have been selling New Jersey Copper Paint for several seasons, and it has given satisfaction to all to whom we have sold it. Our customers speak of it in the highest terms of praise, and say it is the best they have ever used. We expect to sell a good deal of it this spring.

Yours truly, LeBROU & CO.

This engine was built in Cleveland, Ohio, in 1854, for a steam barge called the "R. H. Foss." She was brought to New York via the St. Lawrence in 1866 or 1867, and changed to a grain elevator. This engine was used continuously to 1900 and never renewed in any part, frame, cylinder, crank, connecting rod, hooks, etc., so far as the oldest man in the business knows, being the original.

Courtesy of Mr. JOHN H. DIALOGUE. This engine is in his possession.

Anchors, chains and hawsers required for sail and steam vessels. The weight of anchors does not include the stock, which should be of either iron or wood and in proper proportion to the anchor.

SAIL VESSELS.					STEAMERS.			
Tonnage of Vessel.	Anchors without stock.	Size of Stud Chain Cable.	Length of Stud Chain Cable.	Size of Hawser, 90 fathoms length	Anchors without stock.	Size of Stud Chain Cable.	Length of Stud Chain Cable.	Size of Hawser, 90 fathoms length.
Tons	Pounds	Inches	Fathoms	Inches	Pounds	Inches	Fathoms	Inches
75	600	13-16	90	4	294	11-16	90	3½
100	700	⅞	105	4¼	392	11-16	105	3½
125	800	15-16	105	4½	420	13-16	120	3½
150	900	1	120	4¾	504	13-16	120	4
175	1000	1 1-16	120	5	588	14-16	120	4
200	1100	1⅛	120	5¼	672	14-16	120	4
250	1300	1 3-16	135	5½	840	15-16	120	5
300	1450	1¼	135	5¾	1008	1	120	5
350	1625	1 5-16	150	6	1176	1 1-16	120	5½
400	1850	1 5-16	150	6½	1344	1 2-16	135	6
450	1900	1⅜	165	7	1512	1 3-16	135	6½
500	2125	1 7-16	165	7⅛	1680	1 4-16	150	7
600	2450	1½	180	8	1848	1 5-16	150	7
700	2800	1 9-16	180	8½	2016	1 6-16	165	8
800	3125	1⅝	180	9	2184	1 7-16	165	8
900	3350	111-16	180	9	2380	1 8-16	180	9
1000	3575	1¾	180	9½	2600	1 9-16	180	9
1200	3800	1⅞	180	10	2850	110-16	180	9½
1400	4000	115-16	180	10	3100	111-16	180	10
1600	4250	2	180	10½	3350	112-16	180	10½
1800	4500	2	180	11	3600	113-16	180	11
2000	4700	2 1-16	180	11	3800	114-16	180	11
2500	5000	2⅛	180	11½	4250	2	270	12
3000	5400	2 3-16	180	12	4400	2 1-16	270	12
3500	5800	2¼	180	12	4600	2 2-16	270	12

In these tables will be found the safe load for manila and iron-wire ropes and chains. The load is given in tons of 2,000 pounds.

Wire Rope.		Manila Rope.		Chain.	
Size.	Safe Load.	Size.	Safe Load.	Size.	Safe Load.
1 in.	0.3	1 in.	0.1	¼ in.	0 4
1¼ "	0.6	1½ "	0.2	⅜ "	1.0
1¾ "	0 9	2 "	0.4	½ "	1.8
2 "	1.2	2½ "	0.6	⅝ "	2.8
2¼ "	1.5	3 "	0.9	¾ "	4.0
2½ "	1.9	3½ "	1.2	⅞ "	5.4
2¾ "	2.2	4 "	1.6	1 "	7.1
3 "	2.7	4¼ "	2.0		
3¼ "	3 2	5 "	2.5		
3½ "	3.7	5½ "	3.0		
3¾ "	4.2	6 "	3.6		
4 "	4.8				

Testimonials.

Pensacola, Fla., February 23, 1891.

Mr. Harry Louderbough, Jersey City.

Dear Sir.—We are continually told by our customers who have used the New Jersey Copper Paint, that they find it gives a smoother bottom than other Paints, and gives universal satisfaction every other way. This may be "the same old tale so often told," and not be new to you, still we feel like complimenting you and the New Jersey Copper Paint, and think it classes with the best; and shall shortly have the pleasure of sending you order for the spring and summer supply.

Yours, &c.,

McKENZIE, OERTING & CO.

Note the positive expressions of Quality in the following Testimonials. This verdict is from the users of Copper Paint, that

NEW JERSEY COPPER PAINT

LEADS THEM ALL.

Savannah, Ga., February 3, 1891.

Mr. H. Louderbough.

Dear Sir.—I have, at my Marine Railway, used considerable of your New Jersey Copper Paint, and I believe it to be the best Copper Paint on the market.

H. F. WILLINK.

St. Augustine, Florida, January 31, 1891.

Mr. H. Louderbough.

Dear Sir.—I have sold your New Jersey Copper Paint, and I am fully satisfied of its good qualities, and, being a practical painter, I know a good thing when I see it; it applies easily, freely entering the wood, thereby poisoning it; and its coating is smooth, making a good sailing bottom, and, as an anti-fouler, it is the best I have ever seen. I am yours, &c.,

W. MELFORD INGRAHAM.

Norfolk, Va., January 13, 1891.

Mr. H. Louderbough.

Dear Sir.—I have used, at my Railways at Berkley, Va., painting a large number of vessels with your New Jersey Copper Paint, and I am free to confess it has given splendid satisfaction among my many customers, proving itself to be a very smooth Paint and a great anti-fouler.

I remain, yours, &c., CHAS. J. COLONNA.

Baltimore, Maryland, January, 10, 1891.

Mr. H. Louderbough.

Dear Sir.—I have for years sold about every Copper Paint offered in our market, and, after having this experience, to-day my sales are confined to some three leading Paints, and one of them is your New Jersey Copper Paint, which I believe to be one of the best Paints in this market.

I am, respectfully yours, &c.,

ANTON RASMUSSEN.

Tompkins Cove, N. Y., January 2, 1891.

Mr. H. Louderbough.

Dear Sir.—During the past season I have applied considerable of your Copper Paint, and, after having used all other brands, I must say I am convinced of its very superior qualities over all others, it being so easy to apply, working nicely under the brush, being very fine and smooth, making a splendid sailing bottom. I remain, yours, &c.,

H. J. RODERMOND.

Portland, Me., February 17, 1891.

Mr. Harry Louderbough.

Dear Sir.—We sold your Copper Paint in considerable quantities in 1890. So far as we have been able to ascertain, the results were in every case satisfactory. We have yet to receive the first complaint, a fact which is quite unusual in the sale of a new article. Respectfully yours,

BURGESS, FOBES & CO.

Brooklyn, February, 16, 1891.

Mr. H. Louderbough.

Dear Sir.—We have at our Dry Dock, used some of your New Jersey Copper Paint, and it has given us good satisfaction, being very smooth, having no coarse or rough copper in the bottom of the can, all mixing with the Paint. I remain, yours, &c.,

GEORGE DAVIDSON,

Agent Brooklyn Water Front W. & D. Dock Co.

Fouling and Marine Painting.

The degree of foulness contracted by an unprotected vessel varies with circumstances, a smooth surface will not foul as quick as a rough surface, as the rough surface presents plenty of pockets for the barnacles, worms and other marine growths to lodge in. A vessel lying at anchor will become more foul in the same length of time than one making passage. Some waters are far more troublesome than others, and in a warmer water the vessels will foul quicker, for this reason vessels in the Gulf Stream and moving with the current sometimes foul very quickly, the warmer water facilitating the insect growth.

Experience has shown that the amount of fouling is greater in the tropics than in higher latitudes, and during summer and early fall than at any other time of the year. The port that has the most unenviable reputation in this respect is Surabaya, and it is stated that vessels lying there for a week at any period of the year will become foul, though covered with the best anti-fouling paint ever made. Other ports in Java are of like evil repute, and ships in the ports of the Malabar Coast, and on the Madras Coast, and in Ceylon, foul very readily during eight months of the year. Kurrachee and Bombay are also bad fouling ports during the same season. The surest and safest protection is paint; some lines, that run through bad waters, find it advantageous to dock and paint three or four times a year, as the amount spent in docking and painting will be saved in coal and time.

Marine painting upon the bottoms of vessels, both wooden and iron, has attracted much attention, and in painting problems it has been the most thought about and experimented upon. All kinds of paint compositions have been produced, and out of the many only a very few have met with any pronounced effect in solving the difficulty.

It is a great undertaking to produce a coating of paint over a given surface submerged and partly submerged in salt water under trying conditions, to make this thin coating so poisonous that it will for months resist the fouling tendency so common in salt water, and, upon wooden bottoms, stop the ravages of the toredo worm.

Even in this hard problem comes the usual request for something cheap, and that, too, has to be met by the manufacturer, and, if quality is to be considered, he cannot compete with these cheap productions.

Competition for several years past in Marine Painting has been very sharp, but the standard paints of high grade hold their trade from the fact that the cheap paints offered lack the qualities so essentially necessary, and the varied experiences of the vessel-owner and mariner holds to the fact that the best they can get is the cheapest in the long run.

Disturbances of the Sea.

Wind is air in motion, and sea waves are the direct effect of the friction caused by the wind passing over the water, and calms are due to the absence of such friction.

The terms wave and swell are not infrequently confounded by inexperienced persons; but seldom or never by a seaman. However, a sea can be formed on a very heavy swell, and at the same time be distinct from the swell. The term used in describing this condition would be—a sea and a swell; but if the velocity of the wind should remain constant or increase, the swell will finally become a part of the sea.

The theory advanced by some that waves have a progressive motion, is erroneous. In the most violent gales, a surface drift is experienced and rarely exceeds one mile per hour, except in rotary storms, where this drift sometimes reaches to about five miles per hour; but the body of water which extends above the surface remains in the same position.

An interesting experiment may be made to prove this by throwing overboard a piece of wood when a ship is anchored in an open roadstead during a heavy sea. The sea will appear to run by the ship very rapidly, which is evidently responsible for the term—a sea is running, and for the theory that waves travel. However, the piece of wood will drift no faster than the current, which is also a result of the friction of the wind passing over the water.

A short, chop, cross or lumpy sea does not have the appearance of running by the ship, as one sea apparently rises from the trough of another.

It is a common practice among navigators to allow for a heave of the sea, which is the effect of the sea breaking on or very near the ship.

A very heavy swell is often experienced hundreds of miles from the centre of disturbance, and is nothing more than the subsiding sea seeking its proper level. If increasing, it indicates coming wind, usually strong; but if decreasing, the disturbance is not approaching. Sometimes a swell is due to some volcanic disturbance, or to the luna-tidal wave. Beyond any doubt, the former is more or less responsible for the long, easy, almost constant swell of the Pacific.

The North Atlantic seems to be quite free from volcanic disturbances, from the fact that during the summer months it is often smooth as a mill pond.

Frequently from a change of wind, a cross sea will be experienced, and is sometimes described as lumpy; but so long as the wind continues steady, the new sea will cut down the old and become more regular; but if the wind should be frequently changing, the sea will become more lumpy.

The greatest height of waves so far recorded is forty-two feet from the trough to the crest, and it uncommon to seamen.

Use of Oil for Modifying the Sea.

In using oil for this purpose, the one great difficulty is to have the oil reach the water far enough to windward to give the ship the benefit of its effect. This may be effected by attaching an oil bag to a drag, in case the ship is hove-to with that contrivance.

Running before the wind, oil bags should be towed from both catheads. The tow-line should be of such length as may be necessary to keep the bags in the water.

Hove-to with or without a drag, an oil bag on the weather bow, one about midships and one on the quarter will have a modifying effect.

Mineral oils are of little or no use for this purpose. Animal or vegetable oils are satisfactory. In cold weather, the effect of oil on rough water is considerably less than in warm weather, for the simple reason that the oil thickens and will not spread freely. The result of experiments covering a period of several years seems to indicate that lard oil gives the most satisfactory results.

Oil bags should be made of canvas, and of sufficient size to hold oakum enough to absorb from one to two gallons of oil, and there should be holes in the bag of sufficient size to permit the oil to leak out, and to admit the water in quantities large enough to act as an agent in making the leakage uniform.

Many navigators have condemned oil bags for the simple reason that the oil could not escape; the holes being small, having been made with a sail needle. The holes should be at least one-quarter of an inch in diameter.

"NEW JERSEY"

National Export Exposition Medal.

EN MÆRKVÆRDIG KJENDSGJERNING.

DETTE Billede er en Kopi af et Fotografi taget af et Stykke Bord, den ene Ende af hvilket var malet med NEW JERSEY KOBBERSTOF, fabrikeret af Harry Louderbough, Indehaver af NEW JERSEY PAINT WORKS, Jersey City, N. J., U. S. A. Hele Bordet blev sænket under Vand ved Port Royal, S. C. Efter 5 Maaneders Forlöb blev det optaget. Billedet viser hvorledes Saltvandsormen, en Fjende til alt Træ, har ödelagt den umalede Ende, ligeledes den Mængde Barnakler der har sat sig paa den.

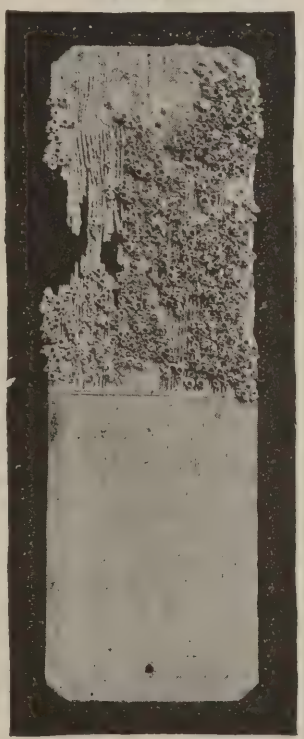
Læg Mærke til den malede Ende, hvortil New Jersey Kobberstof blev brugt—hvor fortrinlig den har holdt sig.

Bordet her fremstillet satte jeg i Söen ved Port Royal, S. C., og lod det staa i Vandet i 5 Maaneder. Den malede Ende fandt jeg saa god, som da jeg satte den ned.

MILLS EDWARD,
Förer af Skonnerten "Florence Shay."

Kun et maerke og dette det beste.

FIRMA MÆRKE.



NEW JERSEY
KOBBERSTOF

KOBBERSTOF.

American Institute Medal.

—VOR—

SKIBS MALING.

SPECIALITETER:

"NEW JERSEY"
- KOBBERSTOF,
- RÖD KOBBERSTOF, For Lystfartöjer.
- ELASTISK NAAD MALING,
- LYSTFARTÖJER, sort "
- " hvid "
- MASTE MALING,
- SKORSTENS MALING,
- DÆK OG GULV MALING.

"American Institute" i New York har tilkjendt os Institutets forste Medalje for vor New Jersey Kobberstof og Naad Maling.

New Jersey Paint Works,
Harry Louderbough, Prop.
JERSEY CITY, N. J., U. S. A.

Management of Small Boats Landing Through a Surf.

Boats employed where it is frequently necessary to beach them when the sea is breaking heavy, are specially constructed for the purpose, and sometimes to meet conditions peculiar to the particular locality, and manned by crews who are not only expert surfmen, but have a thorough knowledge of the best landing places, dangers and other local conditions. For them, landing through a surf is a matter attended with little or no difficulty.

Ships' boats are generally of the keel type and a large percentage of them have square sterns. To safely land such boats through a heavy surf, is not only very difficult, but dangerous, and should never be attempted unless absolutely necessary.

Along most beaches there are many sunken wrecks, and to come in contact with such obstructions in a small boat, during a heavy sea, would most likely result in the loss of all hands. Soundings as given on a chart very close to the beach cannot be relied on, as frequently a shore line is moved in or off shore during violent storms and often causes small shoals, over which a small boat cannot pass during heavy sea.

When making for a beach during a heavy surf, it is impossible for those in the boat to select the place most advantageous for landing, but one on the beach can at a glance do so. Therefore, keep a sharp lookout for people on the beach, and obtain their advice if possible and carefully follow it.

A boat cannot be landed through a surf under sail, and all sail should be taken in before entering broken water.

A boat cannot be handled in a heavy sea or broken water with a rudder, and it must never be attempted. To steer the boat, a long oar must be used and the becket must be of good material. An oar-lock cannot be used in place of a becket.

With a double end boat, it is best to pull in to the beach head on, taking care not to allow her to broach-to and that every sea breaks either ahead or astern of her. This may be effected by either pulling the boat ahead or checking her way, according as her position may require. When the boat goes up on the beach on the last sea, all hands should jump out and hold on to her by the gunwales to prevent her being carried off the beach in the undertow. In some cases it may be advisable to use a small anchor to assist in holding the boat on the beach.

With a square stern boat the method of landing is about the same as for a double end boat, except that before entering the broken water she must be brought head to the sea and landed stern first.

While the value of oil in landing during a heavy surf is not very great, its use is not to be discouraged altogether, as it will certainly diminish the danger rather than increase it.,

Notes Along the Atlantic Coast.

Eighty-five full-rigged ships fly the American flag.

The largest two-masted schooner is the Oliver Ames, 456 tons.

The smallest four-masted schooner is the Massachusetts, 501 tons gross.

The first two-masted schooner was built at Gloucester, Mass., in 1714.

The largest four-masted schooner afloat is the Frank A. Palmer, 2014 tons gross.

The first three-masted schooner was the Zachary Taylor, built at Philadelphia in 1849.

The largest three-masted schooner on the ocean is the Bradford C. French, 968 tons gross.

The smallest five-masted schooner on the high seas is the James Pierce, 1664 tons gross.

The largest five-masted schooner in the world is the Baker Palmer, of Boston. She registers 2792 tons.

The largegst full-rigged ship is the Roanoke, 3539 gross tons, and the smallest, the Dashing Wave, 1054 tons.

The oldest schooner over 300 tons gross register is the two-master Eliza S. Potter, built at Mystic, Conn., in 1857.

The largest American brigantine is the John McDermott, 564 tons gross register, and the smallest, the D. A. Small, 119 tons.

The largest American barkentine is the James Tuft, 1274 tons gross register, and the smallest, the Monitor, 295 tons.

The largest American bark is the J. B. Walker, 2178 gross tons, and the smallest, the President, 123 tons, she being a whaler.

The four-masted schooner Elliot B. Church was the first schooner over 1000 tons gross register ever built. She was finished in 1882.

The first four-masted schooner was the W. L. White and the second the Francis C. Yarnall. The White was built in 1880 and the Yarnall in 1881.

The largest six-masted schooner in the world at the present time is the Eleanor A. Percy, of Bath, Me.; she registers 3401 tons gross. There are two other six-masted schooners afloat, the George W. Wells and the William L. Douglas.

The seven-masted schooner, Thomas W. Lawson, is the first steel schooner built in this country, the first seven-master built in the world and the largest ever built. She registers 5218 tons gross and has a carrying capacity of over 8000 tons.

Law of Storms.

It is a well known fact that all great storms have a rotary and a progressive motion and in many instances cover an area of several hundred miles in diameter. As soon as it becomes known that a ship is in one of these storms, it is important that the bearing of the center and the direction of the storm track should be determined as soon as possible, that the ship's position in the storm may be known.

In north latitude face the wind and the storm center will bear not less than eight, and not more than ten points to the right. Now that the bearing of the center is known, the direction of the storm track can be determined by noting the change of wind.

If the ship is directly on, and in front of the storm track, the wind will not change, and the barometer will rapidly fall, and at the same time the wind and sea will rapidly increase in violence. In that case, run before the wind; note the course, and keep it until the barometer rises, and wind and sea moderate sufficiently to free the ship from danger. If the ship cannot run dead before it, take the wind one or two points on the starboard quarter; but be careful not to take it on the port quarter.

If the wind is southeast, the storm center will bear about S. W. by W.

Suppose the wind changes to S. S. E., which would be to the right, that would prove conclusively that the ship is in the right-hand semi-circle, and that the storm is moving in a northwesterly direction, and the ship should be hove-to on the starboard tack, or run with wind two points on starboard quarter.

On the other hand, suppose the wind is N. E. the storm center will bear about S. E. by S., and the wind changes to N. N. E., which would be to the left, and would show that the ship is in the left hand semi-circle. To better the weather, take the wind two points on the starboard quarter, note the course and keep it. If the ship cannot run, heave-to on the port tack.

It will be noticed that the ship in the left semi-circle lies with her head towards the center when hove-to; but that does not indicate danger, because the ship cannot forereach any. However, she must lie on the coming up tack in all cases, and, if hove-to on an improper tack, she would break off at every change of wind, deaden her way, ship heavy seas, lose sails and probably her masts.

Very frequently a ship can derive considerable advantage in the way of fair wind from a hurricane, if the law of storms is properly understood. As an example: suppose a ship is in the right hand semi-circle with the wind S. W., the storm center bearing about N. W. by W., and the storm track is N. E., and about the same as the ship's course. In such a position, the ship can get out of the storm by either heaving-to on the starboard tack or running with the wind on the starboard quarter. To use the wind, if the wind and sea are heavier than desired, haul the ship more to the eastward, 'till the barometer rises very little, and the wind and sea moderate as desired; then resume the course. On the other hand, if the wind should moderate more than is necessary, haul the ship more to the northward, 'till the wind increases sufficiently; then resume the course. Some care must be exercised in this maneuver to keep the ship as close to the center as safety will permit, or the storm will pass her before she has received a reasonable benefit from it. Under ordinary circumstances a ship should stay with the storm about three days. In the above case she will be out of the storm when the wind changes to W., and find herself becalmed in a short time.

When using a storm in this manner, the bearing of the center must be kept constantly located and a sharp watch be kept on the storm track, as it may change to the eastward, and in case it does, immediate action must be taken to increase the distance from the center. In these storms, a current of three to five knots can be relied on, running with the wind.

In the southern hemisphere the rotary motion of these storms is contrary to those of the northern hemisphere, and the maneuvers would, of course, be contrary to those of the northern hemisphere. However, the progressive motion is from the equator towards the pole in both hemispheres. For hurricane indications see the following notes.

About twenty-four hours, and sometimes two or three days before a hurricane, the barometer will stand somewhat above the normal, with unusually fine, clear weather, with calm or very light variable winds. At such times the atmosphere is unusually clear, and objects are more distinctly visible than ordinarily. The next indication will be a long, quite heavy swell and then the barometer will begin to fall. The air will become more moist, and heavy, black, rolled and ragged clouds will rise in the direction from which the swell came. The barometer by this time will have fallen considerable, and its reading should be frequently recorded, and also the direction of the wind at the same time and at every shift. The clouds will soon nearly or wholly cover the sky and the ship will be on the edge of the violence of the storm, and, with a little skillful handling, she can be brought out safely and the fury and violence of the storm wholly avoided if the instructions given above are followed.

The Barometer.

A rapid rise indicates unsettled weather.

A gradual rise indicates settled weather.

A rise with dry air and cold increasing in summer indicates wind from the northward. If rain has fallen, better weather may be expected.

A rise with a moist air and a low temperature indicates wind and rain from the northward.

A rise with southerly wind indicates fine weather.

A steady barometer and temperature with dry air indicates a continuance of fine weather.

A rapid fall indicates stormy weather.

A rapid fall with westerly wind indicates stormy weather from the northward.

A fall with northerly wind indicates a storm with rain and hail in summer, and snow in winter.

A fall with increased moisture in the air and increasing heat, indicates southerly wind and rain.

A fall with very calm and warm weather indicates rain and squally weather.

The barometer rises for northerly wind, including from N. W. by N. to the eastward, for dry or less wet weather, less wind, or for more than one of these changes, except on some occasions, when rain, hail or snow comes from the northward with strong wind.

The barometer falls for southerly wind, including from S. E. by S. to the westward, for wet weather, stronger wind or one or more of these changes, except on some occasions when moderate wind with rain or snow comes from the northward.

A falling barometer with north wind indicates rain and wind in summer, and snow in the spring.

A sudden fall with the wind west is an indication of very bad weather from the north or northwest.

A steady fall with the wind east indicates that the wind will change to south, or be followed with rain or snow.

A fall of the barometer with a south wind is followed by more or less rain.

If the barometer falls, and after the storm, remains steady and does not rise, bad weather may be expected without a change of wind. On the other hand, if the barometer rises, the wind may change.

The words fair, change, etc., on the barometer should not be regarded, as they have no value.

To obtain advantageous results from the use of a barometer, its reading should be recorded at regular intervals. At the same time a record of the temperature and the direction of the wind should be made. During very bad or unsettled weather, and at times when such weather is expected, the observations should be as frequent as may be convenient.

During fine or settled weather, the barometer will stand highest at 10h A. M. and 10h P. M., and lowest at 4h A. M. and 4h P. M. This oscillation amounts to about .05 of an inch. It then follows that if the reading of the instrument is the same at 10h in the morning as it was some two or three hours earlier, it is equivalent to a fall of .05 of an inch. The other hours of high and low must be considered when the observations are of any importance.

Most barometers are not exactly correct, and before the instrument is put to practical use its error should be known, and can be obtained at any branch Hydrographic office without cost.

With the general rules given above for using the barometer in foretelling the weather, the following weather indications must be considered, as they not infrequently give warning of the coming weather earlier than the barometer.

A clear red sunset with a red sky is an indication of fine weather, and probably westerly winds.

A red sunrise with a red sky is an indication of bad weather with east or northeasterly winds. A pale sky and sunset in a bank of clouds is an indication of easterly wind. A clear yellow sunset indicates strong breeze. A clear pale or gray sky at sunrise indicates fine weather. Soft, downy, delicate clouds and a light blue sky indicate fine weather with light variable winds. A dark and gloomy blue sky is an indication of strong wind, and if the clouds are hard and ragged looking, strong gales may be expected.

A small, white, fleecy cloud often hangs over a small island or reef.

When keeping a record of the barometer readings, it is necessary that they be exact for the nearest hundredth of an inch. The common practice of reading the instrument to tenths only is not sufficient. Figure one shows an aneroid barometer face from 29 inches to 31 inches. The barometer hand cuts 30.43 inches and shows that every tenth of an inch is divided into five parts of .02 of an inch each. The dumb hand cuts 29.29 inches. By recording the readings of the instrument in this way, it is at once noticed by referring to the last reading, if it is rising or falling, which is frequently very important.

The mercurial barometer has a scale graduated to tenths of an inch and by the vernier it is read to .01 of an inch. Figure two shows a mercurial barometer scale and vernier reading

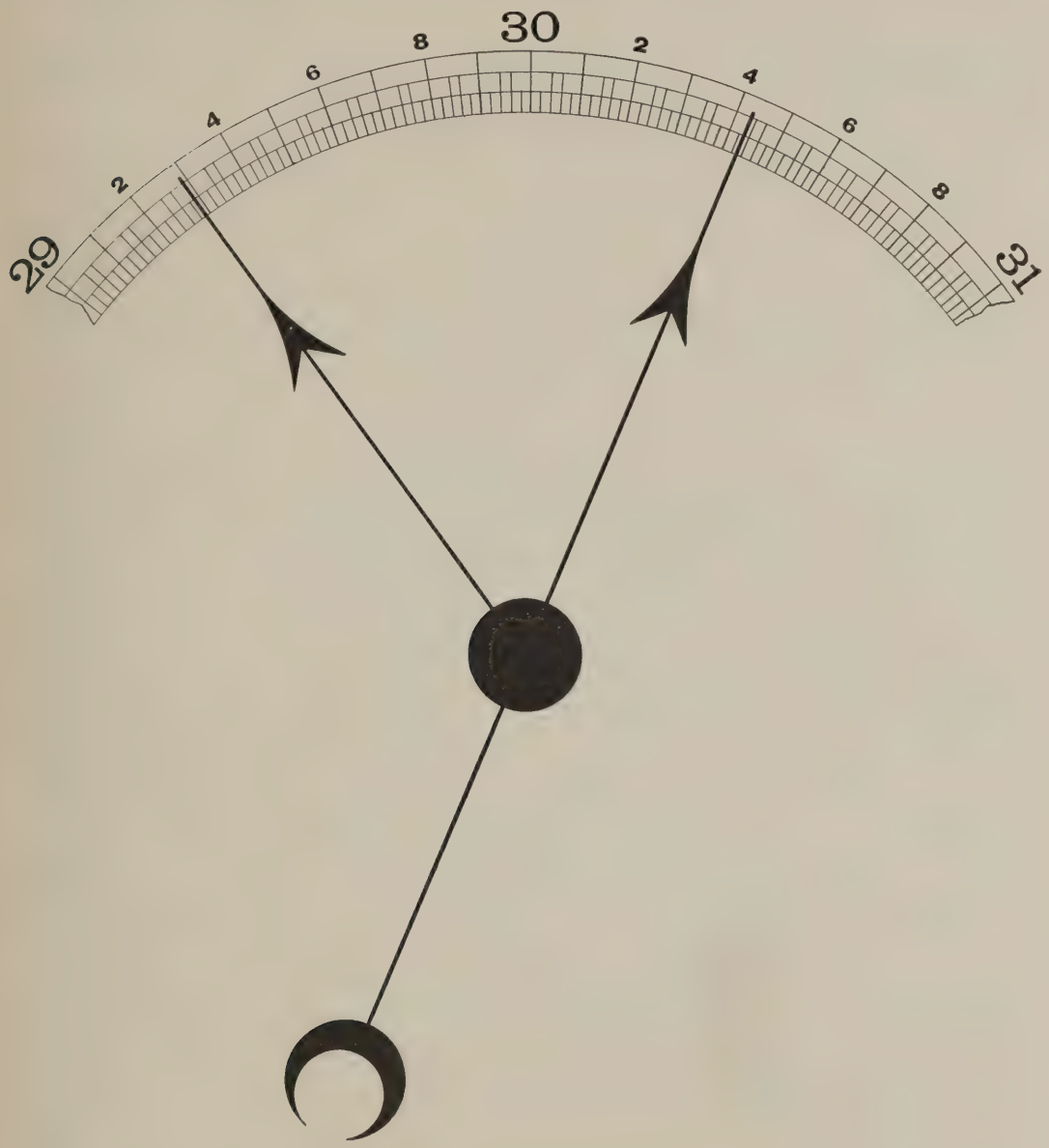


Fig. 1.

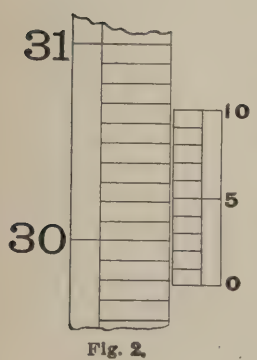


Fig. 2.

29.77 inches. The zero on the vernier is between 29.70 inches and 29.80 inches. On the vernier 7 is the first division which cuts and 29.70 on the scale and .07 on the vernier make the reading 29.77 inches.

Figure three shows a reading of 28.32 inches. The zero on the vernier is between 28.30 inches and 28.40 inches. On the vernier 2 is the first division which cuts, and 28.30 on the scale and .02 on the vernier make the reading 28.32 inches.

A thermometer is attached to each mercurial barometer to obtain the temperature of the mer-

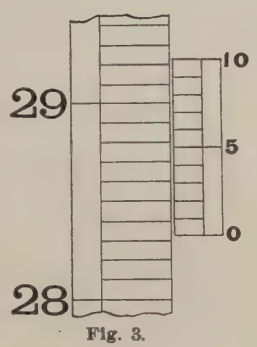


Fig. 3.

cury, and to the reading of the barometer a correction is applied corresponding to the temperature, which, by inspection of the following table, will be found to be of some importance.

Temperature.	Correction Inch	Temperature.	Correction Inch	Temperature.	Correction Inch	Temperature.	Correction Inch
20° F.	+ .02	40° F.	— .03	60° F.	— .09	80° F.	— .14
22	+ .02	42	— .04	62	— .09	82	— .14
24	+ .01	44	— .04	64	— .09	84	— .15
26	+ .01	46	— .05	66	— .10	86	— .15
28	.00	48	— .05	68	— .10	88	— .16
30	.00	50	— .06	70	— .11	90	— .16
32	— .01	52	— .06	72	— .12	92	— .17
34	— .02	54	— .07	74	— .12	94	— .17
36	— .02	56	— .07	76	— .13	96	— .18
38	— .03	58	— .08	78	— .13	98	— .18

No correction for temperature is applied to readings of the aneroid barometer.

This table is from page 23, Bowditch Epitome, and the signs prefixed to the correction indicate how it is to be applied. Plus (+) meaning add. Minus (—) meaning subtract.

TESTIMONIALS.

Brooklyn, N. Y., Nov. 9, 1901.

Mr. H. Louderbough.

Dear Sir.—At our three Dry Docks I have for several years used your "New Jersey" Copper Paint, and it is with a great deal of pleasure that I give it our endorsement, for all the good qualities it possesses; it being smoothly ground, it is easy to apply, producing a good sailing as well as a good Anti-Fouling surface.

Yours truly,
WM. GOKEY.

Boston, Mass., Nov. 4, 1901.

Mr. Harry Louderbough.

Dear Sir.—At our store we have jobbed and retailed your "New Jersey" brands of Marine Paints, and find that our yachtsmen look upon them with great favor, for their good qualities have become pretty well known. As Anti-Fouling Paints, we believe them to be without an equal.

Yours truly, I. H. WILEY & CO.

San Francisco, Cal., Oct. 21, 1901.

Mr. H. Louderbough.

Dear Sir.—We have been using your New Jersey Copper Paint on the bottoms of our Vessels for several years. The fishing business is trying on Copper Paint, as the vessels lie at anchor on the grounds and are particularly liable to become fouled. Your New Jersey Copper Paint has given us entire satisfaction.

Yours truly,
THE McCOLLAM FISHING & TRADING CO.

Tottenville, N. Y., Nov. 20, 1901.

Mr. H. Louderbough.

Dear Sir.—For some ten years we have used, at our Railways and construction plant, your "New Jersey" Copper Paint, and your Yacht Specialties, and have always found them reliable Paints, giving complete satisfaction to our customers and ourselves.

Yours truly, A. C. BROWN & SONS.

Hoboken, N. J., Nov. 20, 1901.

Mr. Harry Louderbough.

Dear Sir.—After many years' use of your "New Jersey" Copper Paint, and "New Jersey" Seam Paint, they have proven to be all that one can expect of them, and we can cheerfully give them a good endorsement, as they are popular, as well with our customers as they are with us.

Yours truly, JOHN McCARTHY & BRO.

New York, Nov. 9, 1901.

Harry Louderbough.

Dear Sir.—In applying your Wetterstedt Copper Paint, we found it to be all you claimed for it. Its smoothness makes it easy to apply; producing a splendid bottom offering no resistance.

Yours truly,
JAS. TREGARTHEN SON & CO.

New York, Dec. 3, 1901.

Harry Louderbough.

Dear Sir.—Your "New Jersey" Copper Paint has always been a favorite with us. After a test of eleven years it has proven to be a reliable Anti-Fouling Paint. Our customers using it once are very apt to use it again.

Yours truly,
JAMES SHEWAN & SONS.

Galveston, Texas, Nov. 13, 1901.

Mr. H. Louderbough.

Dear Sir.—Our Southern waters are very troublesome to our vessels, as they promote the formation of barnacles and vegetation, and your production of "New Jersey" Copper Paint has proven itself to be all that you claim for it, doing its work as an Anti-Fouling Paint very successfully. Our sales of your Perfect Ship Black, in connection with your Copper Paint meets with the very strong endorsement of our friends and ourselves.

Yours truly,
T. L. CROSS & CO.

Perth Amboy, N. J., May 1, 1890.

Mr. H. Louderbough.

Dear Sir.—The use of New Jersey Copper Paint at our Dry Dock and Railway has proven itself to be a very effective Paint, easy to apply, and being very fine, it freely enters the wood and produces a good sailing bottom. We consider it to be the best Copper Paint in the market.

Respectfully,
PERTH AMBOY DRY DOCK CO.

Thomaston, Me., May 24, 1890.

Mr. H. Louderbough.

Dear Sir.—Our repeated orders for your New Jersey Copper Paint must convince you of our favorable opinion of your Copper Paint; in its use our painters all speak well of it. It produces a splended sailing bottom on account of its fineness.

We remain, truly yours,
DUNN & ELLIOT.

Halifax, N. S., Canada, Nov. 22, 1901.

Mr. Harry Louderbough.

Dear Sir.—As agents for your Copper Paint, at this point, it is pleasing to know that after its introduction was started our business has grown to such an extent, that "New Jersey" Copper Paint is now much used in the face of older established paints that once controlled our market.

Yours truly,
CROWELL BROS.

North Sydney, Cape Breton, Nov. 21. 1901.

Mr. Harry Louderbough.

Dear Sir. The best protection that one can apply to the bottom of a vessel is a reliable Copper Paint. When quality is being considered, our patrons give your "New Jersey" Copper Paint the preference, for its well known and well earned reputation places it in the front with all comparisons.

Yours tuly,
FORBES & ARCHIBALD.

San Francisco, Cal., March 31, 1890.

H. Louderbough, Esq.

Dear Sir.—Having given the New Jersey Copper Paint a thorough test, I do not hesitate to say it is the best and most serviceable I have ever used, it having stood for seven months on a voyage from Port Blakeley to Valparaiso and other South American ports, and to-day is nearly as clean as when put on.

For several days I was becalmed on the Equator, and for twenty days was loading at Valparaiso.

In the matter of economy, it can be put on very easily, and covers more bottom than any other Copper Paint I have ever used.

H. R. JACOBSON,
Master Schooner H. C. Wright.

AMERICAN

"Iron Crown" Paint

FOR IRON AND STEEL VESSELS' BOTTOMS.

AN OLD AND RELIABLE PAINT

FOR FIRST AND SECOND COATS.

No. 1

PRIMING COAT.

AN IRON PRESERVATIVE.

DRIES QUICKLY.

No. 2

FINISHING and ANTI-FOULING PAINT.

TESTIMONIALS OF MERIT

After Years of Trial Demonstrate Its Effectiveness.

New Jersey Paint Works,

HARRY LOUDERBOUGH, Proprietor.

Jersey City, N. J., U. S. A.

Successor to R. F. Seaman.

Notes on Cargo, Bills of Lading, etc.

CHARTER PARTY.

A charter party is an agreement in writing, between the master or owner of a ship and the charterer, that the vessel shall perform a certain service for which the owners shall receive a certain consideration. The clauses are the voyage, freight, lay days, demurrage, etc.

BILL OF LADING.

A bill of lading is a receipt for cargo received on board a ship, and an agreement to deliver such goods at some port for a certain consideration. There are usually three of these documents—one for the consignor, one for the consignee and one for the master, all signed by the master, owner or some authorized agent of the owner. The exceptions are such as the acts of God, the country's enemies, fire, stranding, collisions, and all other accidents and dangers of the sea, over which the master has no control. Such clauses as weight and contents unknown; not responsible for breakage, leakage, etc., should be inserted as the nature of the cargo and voyage may require. How the freight is to be paid should also be stated, and the lay days and demurrage.

It is advisable, with some cargoes that are perishable, to state that the freight is payable for the quantity loaded, and with very dangerous cargoes, and on perilous voyages, the freight should include its cost of insurance.

On arriving at the port of destination, the cargo must be delivered to the person presenting a bill of lading, properly indorsed by the consignor, and in case two such bills of lading should be presented, the cargo may be delivered to the person presenting the first one; but it would be better, under such circumstances, to store the goods until instructions are received from the consignor, and then deliver them to the proper person when the freight and expenses are paid.

Before signing a bill of lading or charter party, see that the expense for lighterage does not fall on the ship, in case the port of discharge is such that she cannot reach a dock, and in case the cargo is to be lightered, the ship is not responsible for any loss of cargo after being passed over the rail to a lighter.

The freight should always be paid or secured in proportion to the quantity of cargo delivered.

LAY DAYS.

When a ship is chartered, the number of days in which the vessel is to be loaded and discharged, should be specified, and the demurrage to be paid the ship for any additional time that may be required.

DEMURRAGE.

Demurrage is the compensation to be paid for the detention of a ship beyond the number of days agreed upon, and must be claimed daily, as it becomes due. The owner of a ship has no claim on the cargo for demurrage, unless stated in the bill of lading, and therefore it is important that this clause should be inserted. Where there are both bill of lading and charter party, the former should be indorsed as follows:—Paying freight and other charges as per charter party with all the conditions therein.

PROTEST.

A protest is a declaration made by the master of a ship before a notary, or consul if in a foreign port, within twenty-four hours after arrival in port after a disaster, stating that he anticipates that the ship or cargo or both have been damaged, and that same was not due to any fault of the vessel, her officers or crew; but to the perils of the sea, and protesting against them. It must be signed by the master and some member of the crew. Afterwards it may be extended to show particulars of storms, etc. that caused the damage. The log-book should support the statements made in the protest.

After noting a protest, a survey of the ship and cargo must be held before breaking bulk, and to begin by opening the hatches. Where merchants are acting as surveyors, they should submit some evidence to the master that they are not in any way interested in the cargo.

To prevent any claim on the ship for damage by water, the surveyors must certify that the hatches were properly secured, and cargo properly dunnaged, and to enable the consignor to make a claim on the underwriters, the surveyors must certify that the cargo is damaged by sea water.

GENERAL AVERAGE.

When a loss is the result of a voluntary sacrifice of part of a ship or cargo, or both, for the safety of the whole, all the parties interested in the ship, freight and cargo, must contribute to the loss in proportion to the value of their interest. Some evidence should be produced to show that the sacrifice was necessary and the log-book should support it. Before any portion of the cargo is delivered, all the parties concerned must sign the general average bond. The ship may hold the cargo until the general average claim is satisfied.

PARTICULAR AVERAGE.

When a partial loss or damage to a ship or cargo must bear the loss resulting from such damage.

JETTISON.

To lighten or relieve the ship by throwing cargo overboard. That part of the cargo which floats is called flotsam; that which sinks is called jetsam, and that which is sunk and buoyed is logan.

BOTTOMRY.

A bottomry is a contract by which the master or owner of a ship gives the vessel, and sometimes the freight, as security for money loaned the ship to enable her to complete the voyage. If the first loan is not sufficient, borrow a second, or even a third time if necessary. The last loan is to be paid first, and the first last. No law regulates the interest on money loaned in this manner, and if the ship is lost before completing the voyage, the lender loses the principal and interest.

RESPONDENTIA.

When sufficient money cannot be borrowed on the ship and freight, the cargo is given as security, and should never be resorted to if possible to avoid it. The contract is the same as a bottomry.

MORTGAGE.

A mortgage is the ship given as security for money advanced the owner and he may spend it as he pleases.

MANIFEST.

A manifest is a list of the cargo with a description of same, names of the consignee, consignor, vessel, master, tonnage of the ship, port of loading and discharging, list of the crew and passengers, if any, and their baggage, and must be signed by the master. There are usually several copies of this document, the original being required by the customs authorities in entering the ship.

VOUCHERS.

All receipts for money expended should clearly state the purpose for which such expenditure was made.

FREIGHT.

The word freight is sometimes used as a term meaning cargo. It is the amount agreed upon in payment for transportation of cargo, and should never be used in any other sense. The freight may be demanded before the cargo is delivered to the consignee.

INVOICE.

This document must contain a detailed account of the cargo, stating the number of packages, their contents, value, charges, freight, insurance, and their marks and numbers. Also the name of the vessel, her master, port of destination, and name of consignee. The customs authorities require this document for assessing the duties on the goods.

BILL OF HEALTH.

This document is issued by the health or customs authorities, or if in a foreign port by the consul, and is supposed to state the number of cases of contagious diseases in the port at which it is issued, and the ship should not sail without it. When bound to a foreign port, it is well to have the statements in this document verified by the consul representing the country to which the ship is bound.

DEAD FREIGHT.

When a charterer agrees to give a ship a complete cargo, and for any reason does not do so, he must also pay the freight on the quantity the ship requires to finish loading. The amount must be collected at the port of loading. After this payment is made the ship must not take more cargo, but proceed to her port of destination without unnecessary delay, unless she is so loaded as not to be seaworthy. However, it might be advantageous to the ship to make some slight concession to the charterer to free the ship from all responsibility for delay caused by completing the cargo with goods from another party, and even another port.

PORT CHARGES AND GENERAL EXPENSES.

Pilotage, towage, provisions, water, harbor and hospital dues, cost of labor for discharging and loading, wharfage, cost of coal and any other expense to which a ship is liable to be subjected.

A ship should never be chartered for a port of which the master and owner have no knowledge until full information of the place has been obtained. It is important to know if the port affords a safe harbor, or is an open roadstead; the depth of water and the harbor regulations.

Where a ship must call at two ports in the tropics, whether the first port of call is to windward or leeward should be taken into consideration.

No member of the crew or any passenger must leave the ship, and no person must be allowed to board her except the pilot, until the health authorities have boarded the vessel and given permission, which they will do provided the ship has a clean bill of health.

In ports that are infected with contagious disease, no member of the crew should be per-

mitted to go ashore, and natives should not be allowed on board, except on business concerning the ship. Every reasonable care must be exercised to prevent any member of the crew from smuggling, and violating any other laws, rules or regulations of the port.

BARRATRY.

A fraudulent breach of duty or willful act of known illegality on the part of a master of a ship in his character as master, or of any other member of the crew, to the injury of the ship or cargo, or both, and without the consent of the owners, consignees or consignors, and includes every breach of trust committed with dishonest intentions, such as running away with the ship, sinking, abandoning, deserting, stranding, or setting her afire without proper cause, or by embezzling the cargo or any part of either ship or cargo.

PRECAUTION.

Never sign a receipt for cargo until its condition is known, and if not in proper condition, state the facts to the person delivering the goods, and if he wishes to leave them, state the incompleteness, damage, breakage, leakage or shortage, or other fault, on the receipt in ink before signing same. It is a wise policy to retain a copy of such receipts for future reference.

Never sign any paper until its contents are known and thoroughly understood.

If in doubt about signing any paper, postpone it and think it over, or consult some reliable person from whom proper information may be obtained.

Before signing any paper written in a foreign language, insist upon having a true copy of same in some language understood.

Never permit any person to perform any service whatever for a ship, unless some kind of an understanding or agreement has been first arranged.

OFFICIAL LOG BOOK.

This book is supplied to masters by the U. S. Shipping Commissioners, and in it must be recorded all events of importance. The list of the crew, deaths, births, marriages, collisions, offences, fines and punishment, sending a passenger or member of the crew to the hospital, etc., are important matters that must be recorded. Certain spaces are arranged in the book for keeping account of any dealings seamen may have with the ship. The book contains full instructions for its use, and is to be handed to the U. S. Shipping Commissioner on arrival in port, and is used by him in paying off the crew and preparing their discharges.

TESTIMONIALS.

Jersey City, N. J., January 27, 1891.
Mr. H. Louderbough.

Dear Sir.—Some months ago I put a new rudder in schooner Florence Shay and painted it with your New Jersey Copper Paint, the bottom of the vessel being coppered. When I docked the vessel a year later, the painted rudder was as smooth as when painted, while the copper on my vessel was filled with large and small barnacles, showing that the New Jersey Copper Paint gave me better protection than the sheet copper. I remain, yours, &c.,

MILLS EDWARDS,
Master Sch. Florence Shay.

White Haven, Maryland, Febraury 1, 1901.
Mr. H. Louderbough.

Dear Sir.—In the use of New Jersey Copper Paint, we were enlisted in its favor by its good qualities. We have yet to find any one who has not a good word to say for it. It is a very smooth Paint, and greatly liked. I remain, yours, &c.,

GRANVILLE M. CATLIN.

Charlottetown, P. E. Island, Nov. 25, 1901.
Mr. Harry Louderbough.

Dear Sir.—I have in my business, handled to quite some extent, your "New Jersey" Copper Paint, and it has met with favor from its first introduction, giving results that have established it to be the best Copper Paint made. Yours truly,

A. KENNEDY & CO.

Blackwater, Florida, February 19, 1891.
Mr. H. Louderbough.

Dear Sir.—It has been our good fortune to handle your New Jersey Copper Paint at our Dry Dock, and our repeated orders for the same all bear testimony of our opinion of it. We believe it to be the easiest to apply and best Paint in the market.

We remain, respectfully yours, &c.,

OLLINGER & BRUCE.

Manasquan, N. J., Nov. 27, 1901.
H. Louderbough.

Dear Sir.—I have, as master of Vessels, had a wide experience with Copper Paints, and have used about all the brands manufactured and I am free to acknowledge that your "New Jersey" Copper Paint has given me better results than any other Copper Paint I have ever used and I find this to be the general expression among my friends who, like myself, have been shipmates with the other brands of Copper Paints. I remain, very truly yours,

ASHER CURTIS.

Yarmouth, N. C., Dec. 4, 1901.
Mr. Harry Louderbough.
New Jersey Paint Works,
Jersey City, N. J.

Dear Sir.—We have used your "New Jersey" Copper Paint for a long number of years on the fishing schooners which we supply as well as those we own. It is a great favorite with us and we give it the preference over other brands. Yours, &c.,

A. F. STONEMAN & CO.

Pictou, Nova Scotia, Nov. 18, 1901.
Mr. Harry Louderbough.

Dear Sir.—Among our customers, and in use at our Railway, your "New Jersey" Copper Paint is very popular owing to the fact that after a trial of several years, it has brought itself to the front in competition with other Paints, making its success through merit. Yours truly,

J. & J. YORSTON.

Georgetown, P. E. Island, Nov. 25, 1901.
Mr. Harry Louderbough.

Dear Sir.—Many years ago all kinds of paint was used to protect a vessel from barnacles and all water worms, but experience has established this fact: that Copper Paint retains its poisoning qualities and is the most effective anti-fouling Paint discovered. Better the Paint, the better results obtained, and it is the good qualities of your "New Jersey" Copper Paint, that has attracted Mariners to its use which has become so general. Yours truly,

A. A. MACDONALD & BRO.

Mathematical Signs.

\+ PLUS. The sign of addition; as 2° 50′ + 17′ = 3° 07′. When prefixed to a number thus, + 16′ 05″, it indicates that the quantity is positive, and when placed to the right of a number, it indicates that some figures have been dropped, as 3.14159+. *See* π.

— MINUS. The sign of subtraction; as 3° 10′ — 24′ = 2° 46′. When prefixed to a number thus, — 57′ 17″, it indicates that the quantity is negative.

= EQUAL TO. The sign of equality; as 67° 45′ 30″ = 4h 31m 02s.

× MULTIPLY. The sign of multiplication; as 43° 50′ × 2 = 87° 40′.

• DECIMAL POINT. The sign indicating by its position the value of a number; as

125. is one hundred and twenty-five.
12.5 is twelve and one half, or $12\frac{5}{10}$.
1.25 is one and one quarter, or $1\frac{25}{100}$.
.125 is one eighth, or $\frac{125}{1000}$; all of which are expressed decimally.

÷ DIVIDE. The sign of division; as 17° 10′ ÷ 2 = 8° 35′, and is more frequently written thus, $\frac{17° 10′}{2}$ = 8° 35′.

ϖ DIFFERENCE. This sign indicates that the difference of the two numbers between which it is placed, is to be considered; as $\overline{30° 10′ \varpi 28° 27′} \times 2 = 3° 26′$. *See vinculum.*

: :: : PROPORTION. As 40m : 60m :: 8′ : 12′; or, as 40m is to 60m so is 8′ to 12′; but more frequently written thus $\frac{60\text{m} \times 8′}{40\text{m}} = 12′$.

^{2} TO BE SQUARED; as $7^2 = 49$, which is $7 \times 7 = 49$.

^{3} TO BE CUBED; as $6^3 = 216$, which is $6 \times 6 = 36$ and $36 \times 6 = 216$.

$\sqrt{}$ RADICAL SIGN. This sign when prefixed to a number indicates that its square root is to be taken; as $\sqrt{36} = 6$.

$\sqrt[3]{}$ THIS sign when prefixed to a number indicates that its cube root is to be taken; $\sqrt[3]{216} = 6$.

—— VINCULUM. This sign indicates that the quantities under it are to be considered together or collectively; as $\overline{3 + 5} \times 4 = 32$. Without the vinculum this equation would be $3 + 5 \times 4 = 23$.

( ) BRACKETS or PARENTHESES. Are used the same as the vinculum; as $(3 + 5) \times 4 = 32$.

π THE number 3.14159265358979 3+; The ratio of the circumference of a circle.

n ANY. Meaning any number or quantity.

DECIMALS.

Decimals are fractions which have some power of ten for their denominators, and are written without the denominator, which is understood. The value of a fraction expressed decimally is determined by its number figures, to the left of which a point (.) is always placed.

The fractional parts of a dollar are expressed decimally and offer the student a valuable aid.

10 mills = 1 cent, 10 cents = 1 dime, 10 dimes = 1 dollar, or 1 dollar = 10 dimes, 10 dimes = 100 cents, 100 cents = 1000 mills.

One dime is $\frac{1}{10}$ or $\frac{10}{100}$ of a dollar, and as a decimal is written .1 or .10, which shows that ciphers have no value when placed on the right hand side of a decimal, as 1 dime and ten cents are equal. From the above description of a dollar, it is clear that it contains 1000 mills. Then, as one cent contains 10 mills, it must be $\frac{10}{1000}$ of a dollar, and it as a decimal is written .010, which shows that ciphers placed on the left hand side of a decimal, alter its value.

Just as the dollar is divided into 10, 100 or 1000 parts, so is anything else when necessary.

ADDITION.

Decimals are added the same as whole numbers, except that the straight line is on the left hand side, and the decimal point is placed in the sum directly under the position it occupies in the quantities added.

Examples: Find the sum $1.30, .17 and .08. Also 8.42 miles, 1.30 miles and .08 miles.

Dollars.	Miles.
1.30	8.42
.17	1.30
.08	.08
1.55	9.80

Ans. one dollar and fifty-five cents. Ans. nine miles and eighty hundredths.

SUBTRACTION.

Place the numbers, one under the other, having regard for the decimal point as in addition, and subtract the lesser quantity from the greater.

Example: From $9.80, subtract $1.55. From 19.6 fathoms, subtract 8.7 fathoms.

Dollars.	Fathoms.
9.80	19.6
1.55	8.7
8.25	10.9

Ans. 8 dollars and 25 cents. Ans. 10 fathoms and nine tenths.

MULTIPLICATION.

Multiplication of decimals is the same as in the case of whole numbers, except that the product must contain as many decimals as are contained in the multiplicand and multiplier. If the product does not contain the required number of figures, supply the deficiency by placing ciphers to the left.

Examples: A ship sails 5.6 miles per hour for 4.7 hours. Find the distance run. Also find how far she will run in 7.3 hours at the same rate of speed.

Speed per hour	5.6	Speed per hour	5.6
Hours run	× 4.7	Hours run	× 7.3
	392		168
	224		392
Dist. in Miles=	26.32	Dist. in Miles=	40.88

DIVISION.

Place the divisor and dividend the same as in whole numbers. Move the decimal point in the dividend to the right as many places of figures as there are decimals in the divisor. Then treat the divisor as a whole number and proceed as in whole numbers. The number of decimals in the quotient will be the same as the number of decimals in the dividend, remembering that the decimal point in the dividend has been moved to the right, provided there are decimals in the divisor.

Example: A ship sails 7.8 miles in 7h.5. What is her speed per hour, and if she runs 14.3 miles in 1.7, what will be her speed per hour?

7h.5)7′.8,00(1.04	1h.7)14′.3,00(8.41+
75	136
300	70
300	68
	20
	17
	3

Ans. 1.04 per hour. Ans. 8.41 + per hour.

REDUCTION.

For convenience in performing the various operations in arithmetic, it becomes necessary to turn vulgar fractions into decimals and decimals into vulgar fractions.

To reduce a vulgar fraction to a decimal, place a decimal point to the right of the numerator, and to the right of the decimal point place as many ciphers as may be necessary and then divide the numerator by the denominator, and the quotient will be the required decimal and must contain as many figures as are contained in the dividend.

In this operation, such fractions as 9 inches would be expressed $\frac{9}{12}$, 27 minutes $\frac{27}{60}$, and 6 hours $\frac{6}{24}$, as there are 12 inches to a foot, 60 minutes to an hour and 24 hours to a day.

Examples: Reduce 33 minutes and 51 minutes to decimals of an hour.

60)33m.00(.55	60)51m.00(.85
30 0	48 0
3 00	3 00
3 00	3 00

Ans. 33m. = .55 of an hour. Ans. 51m. = .85 of an hour.

Examples: Reduce ⅛ of a mile and 3 hours to decimals.

8)1.000(.125	24)3.000(.125
8	24
20	60
16	48
40	120
40	120

Ans. ⅛ mile =.125 of a mile. Ans. 3 hours =.125 of a day.

Navigators generally reduce the minutes of an hour to a decimal mentally, as they do not require more than one or two decimal places. It is only necessary to take the number of times 6 is

contained in the number of minutes as the number of tenths. This is made possible because 6 is one-tenth of 60.

To reduce a decimal to days, hours, fathoms, feet or inches, as the case may require, multiply the decimal by the number of parts in the unit to which the reduction is desired.

Examples: Reduce 8.75 fathoms to feet and inches. And 2.25 feet to inches.

8.75	2.25
× 6	× 12
52.50	450
× 12	225
100	27.00
50	
6.00	

Ans. 52 feet and 6 inches. Ans. 27 inches.

Examples: Reduce 5.56 days to days, hours, minutes and seconds. And 2.56 hours.

5d.56	2h.56
× 24	× 60
224	33.60
112	60
13.44	36.00
× 60	
26.40	
× 60	
24.00	

Ans. 5d 13h 26m 24s. Ans. 2h 33m 36s.

TO USE LOGARITHMS.

The various operations in arithmetic may be performed by logarithms at a saving of considerable time and labor. They so shorten and simplify mathematical calculations that the results obtained can be relied on as correct.

A logarithm consists of two parts; the characteristic or index and the mantissa or decimal part, The decimal part is found in table 42 and the index must be supplied. Having obtained the logarithm from table 42 corresponding to a certain number, the index is always one less than the number of figures in the number to the left of the decimal point. The logarithm of a number that is a decimal is found in table 42, the same as a whole number. The index of a logarithm of a decimal is always 9 when no ciphers immediately follow the decimal point. For every cipher following the decimal point, deduct one from nine and then the result will be the required index.

The following table will show the index for all numbers in ordinary use:

Number.	Index.	
4852.	3.	
485.2	2.	
48.52	1.	
4.852	0.	
.4852	9.	log. .68592
.04852	8.	
.004852	7.	
.0004852	6.	

This table shows that the logarithm with the exception of the index is the same for each number.

This logarithm .68592 is from table 42. In the left hand column 485 is found and at the top or bottom the 2 is found. At the intersection .68592 is found.

MULTIPLICATION.

To multiply one number by another, take the logarithms from table 42 for each number and add them together. Their sum, rejecting 10 of the index if it exceeds 9, will be the logarithm of the product of the two numbers. Find this logarithm in table 42 and the corresponding number will be the required quantity.

Example: A ship makes 12⅘ miles per hour. What distance will she run in 5h 45m?

12′⅘	= 12′.6	log.	1.10037	table 42, page	391.
5h 45m	=5h.75	"	+ .75967	" 42, "	398.
Dist. 72′.45	=	"	1.86004	" 42, "	401.

Example: Multiply .51 by .07.

.51		log.	9.70757	table 42, page	397.
.07		"	+ 8.84510	" 42, "	401.
.0357	=	"	8.55267	" 42, "	395.

DIVISION.

To divide one number by another, take their corresponding logarithms from table 42 and supply the index as explained under multiplication. Subtract the logarithm of the divisor from that of the dividend, and the result will be the logarithm of the quotient. If the dividend is less than the divisor, the index of its logarithm must be increased by adding 10 to it.

Example: A ship runs $93\frac{1}{10}$ miles in 7h 36m, what is her speed per hour?

93′ 1-10		93′.1		log.	1.96895	table	42,	page	404.
7h 36m	—	7h.6		"	— .88081	"	42,	"	402.
Speed		12′25	—	"	1.08814	"	42,	"	391.

Example: Divide .61 by .8.

.61				log.	19.78533	table	42,	page	399.
.8				"	— 9.90309	"	42,	"	402.
.7625	—	"			9.88224	"	42,	"	402.

See the three first problems on page 48 of THE PILOT AND HOW TO DO THE WORK.

TO EXTRACT ANY ROOT.

Without the use of logarithms, more or less difficulty is attached to this operation; but with ogarithms it is very simple, as it is only necessary to take the logarithm of the number from table 42, and divide it by the index of the required root. By this method it is no more difficult to extract the cube root than the square root.

Example: Extract the square root of 2304. This expression is properly written $\sqrt{2304}$.

2304		log.	2)3.36248	table 42,	page 398.
48.	—	"	1.68124	" 42,	" 397.

Example: $\sqrt{529}$.

529		log.	2)2.72346	table 42,	page 398.
23	—	"	1.36173	" 42,	" 393.

Example: Extract the cube root of 729. This expression is properly written $\sqrt[3]{729}$.

729		log.	3)2.86273	table 42,	page 401.
9	—	"	.95424	" 42	" 404.

Example: Square 27. This expression is written 27^2.

27		log.	1.43136	table 42,	page 393.
		index	× 2		
729	—	log.	2.86272	" 42,	" 401.

Example: 4^3 which means that 4 is to be cubed or raised to the third power.

4		log.	.60206
		index	× 3
64	—	log.	1.80618

Decimal Equivalents of Sixtieths.

In every calculation in navigation it is necessary to reduce seconds (″) to a decimal part of a mile; seconds (s) to a decimal part of a minute; minutes (m) to a decimal part of an hour, and the contrary. The following table contains the decimal equivalent for every sixtieth:

′ or ″ m. or s.	Decimal.	′ or ″ m. or s.	Decimal.	′ or ″ m. or s.	Decimal.	′ or ″ m. or s.	Decimal.
1	.017	16	.267	31	.517	46	.767
2	.033	17	.283	32	.533	47	.783
3	.05	18	.30	33	.55	48	.80
4	.067	19	.317	34	.567	49	.817
5	.083	20	.333	35	.583	50	.833
6	.10	21	.35	36	.60	51	.85
7	.117	22	.367	37	.617	52	.867
8	.133	23	.383	38	.633	53	.883
9	.15	24	.40	39	.65	54	.90
10	.167	25	.417	40	.667	55	.917
11	.183	26	.433	41	.683	56	.933
12	.20	27	.45	42	.70	57	.95
13	.217	28	.467	43	.717	58	.967
14	.233	29	.483	44	.733	59	.983
15	.25	30	.50	45	.75	60	1.00

Examples: 8s. — 0m. .133. 26′ — 0′ .433. 44m. — 0h. .733.

Astronomical Signs.

SIGNS OF THE PLANETS.

☉ The Sun.	⊕ The Earth.	♄ Saturn.
☾ The Moon.	♂ Mars.	♅ Uranus.
☿ Mercury.	♃ Jupiter.	♆ Neptune.
♀ Venus.		

SIGNS OF THE ZODIAC.

Spring Signs.	Summer Signs.	Autumn Signs.	Winter Signs.
1 ♈ Aries.	4 ♋ Cancer.	7 ♎ Libra.	10 ♑ Capricornus.
2 ♉ Taurus.	5 ♌ Leo.	8 ♏ Scorpius.	11 ♒ Aquarius.
3 ♊ Gemini.	6 ♍ Virgo.	9 ♐ Sagittarius.	12 ♓ Pisces.

☌ Conjunction, or having the same Longitude or Right Ascension.
□ Quadrature, or differing ± 90° in Longitude or Right Ascension.
☍ Opposition, or differing 180° in Longitude or Right Ascension.

☊ Ascending Node.	E. East.	″ Seconds of Arc.
☋ Descending Node.	W. West.	h Hours.
N. North.	° Degrees.	m Minutes of Time.
S. South.	′ Minutes of Arc.	s Seconds of Time.

Middle Latitude Sailing.

This method is chiefly used for finding the course and distance between ports not far apart, and for working the latitude and longitude up to the instant of observation, and embraces what is termed as Parallel Sailing. For obtaining longitude by account, it is indispensable.

When the course and distance between two ports are required, find the differences of their latitudes and longitudes. Then find the middle latitude by adding together the latitudes of the places and dividing the sum by 2. With this middle latitude, enter table 2 as if a course, and find the difference of longitude in the distance column, and the corresponding number in the latitude column will be the departure. Then with the difference of latitude and departure, enter table 2, and where they are found to agree nearest in their respective columns, will give the course and distance on the same page. If the difference of latitude is greater than the departure, read from the top of the page; but if the departure is the greater, read from the bottom.

Example: Find the course and distance from Barnegat light to Fire Island light.

Lat. Barnegat			39°	45′	52″	N.	Long. Barnegat		74°	06′	24″	W.
" Fire Island			40	37	57	N.	" Fire Island		73	13	08	W.
Diff. lat.	52′.1	—		52	05	N.	Diff. long.	53′.3	—	53	16	E.

Lat. Barnegat	39°	45′	52″	N.
" Fire Island	40	37	57	N.
2)	80	23	49	
Middle lat.	40	11	54	— 40° Diff. long. 53′.3 — Dep. 40′.6 E.

Diff. lat. 52′.1 N.
Dep. 40.6 E. } — Course N. 38° E., dist. 66 miles.

Example: Find the course and distance from Mount Desert Rock to Cape St. Mary.

Lat. Mt. Desert			43°	58′	08″	N.	Long. Mt. Desert		68°	07′	44″	W.
" Cape St. Mary			45	05	20	N.	" Cape St. Mary		66	12	30	W.
Diff. lat.	7′.2	—		07	12	N.	Diff. long	115′.2	— 1	55	14	E.

Lat. Mt. Desert	43°	58′	08″	N.
" Cape St. Mary	44	05	20	N.
2)	88	03	28	
Middle lat.	44	01	44	— 44° Diff. long. 115′.2 — Dep. 82′.7 E.

Diff. lat. 7′.2 N.
Dep. 82.7 E. } — Course N. 85° E, dist. 83 miles.

Mercator's Sailing.

When the course and distance between two ports are required, find the differences of their latitudes and longitudes as in Middle Latitude Sailing. Then from table 3 take the meridional parts corresponding to each latitude, and their difference will be the meridional difference of latitude. Enter table 2 with the meridional difference of latitude in the latitude column, and the difference of longitude in the departure column, and where they are found to agree nearest, the course will be given. On the same page, find the proper difference of latitude in the latitude column, and the corresponding number in distance column will be the required distance.

If the meridional difference of latitude is greater than the difference of longitude, read from the top of the page; but if the difference of longitude is greater, read from the bottom.

Example: Find the course and distance from Great Inagua Island light to Baracoa, Cuba.

Lat. Inagua Is.	20° 56′ 00″ N.	Mer. Parts	1276′.7 N.	Long. Inagua Is.	73° 40′ 17″ W.
" Baracoa	20 21 40 N.	" "	1240 .6 N.	" Baracoa	74 29 34 W.
Diff. lat.	34′.3= 34 20 S.	" diff. lat.	36 .1 S.	Diff. long.=49′.3	49 17 W.

Mer. diff. lat. 36′.1 S.
Diff. long 49 .3 W. } = Course S. 54° W.

Proper diff. lat. 34′.3 = Dist. 58 miles.

Example: Find the course and distance from Cape Maysi light to Castle Island light.

Lat. C. Maysi	20° 15′ 10″ N.	Mer. Parts	1233′.2 N.	Long. C. Maysi	74° 09′ 41″ W.
" Castle Is.	22 06 40 N.	" "	1352 .6 N.	" Castle Is.	74 19 26 W
Diff. lat.	111′.5 = 1 51 30 N.	" diff. lat.	119 .4 N.	Diff. long. 9′.7 =	9 45 W.

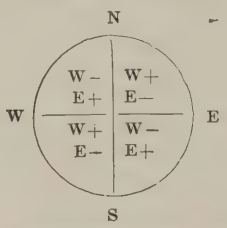
Mer. diff. lat 119′.4 N.
Diff. long 9 .7 W. } = Course N. 5° W.

Proper diff. lat. 111′.5 = Dist. 112 miles.

Correcting Courses.

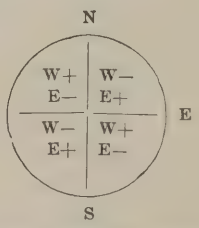
The true course is the result of the calculation to find the course between any two ports. To steer that course by the ship's compass, it must be reduced to a compass course. On the other hand, when a ship's course by compass is given, it must be reduced to a true course that it may be used in table 2. The two compasses are given to facilitate these operations.

Compass No. 1 is for turning true courses into magnetic or compass courses. Compass No. 2 is for turning compass or magnetic courses into true courses.



No. 1

No. 2



To turn a true course into a compass course, apply the variation, deviation, etc., according to the signs in that quadrant in which the course falls in compass No. 1.

Example: The true course from Barnegat light to Fire Island light is N. 38° E. Variation of the compass is 9° W. Deviation of the ship's compass for that course is 3° E.

True course	N. 38° E.
Variation	+ 9 W.
Magnetic course	N. 47 E.
Deviation	— 3 E.
Compass course	N. 44 E.

To turn a compass course into a true course, apply the variation, deviation, etc., according to the signs in compass No. 2.

Example: A ship sailed the course, S. 54° E., by compass. The variation was 8° E., and deviation 6° E.

Compass course	S. 54° E.
Variation	— 8 E.
Magnetic course	S. 46 E.
Deviation	+ 6 W.
True course	S. 52 E.

Mercator and Middle Latitude Sailings by Computation.

The course and distance between any two ports not far apart or for a short run may be found by inspection with sufficient degree of accuracy for general purposes; but when very exact courses and distances are required, the result obtained by inspection will not answer and it is necessary that they be computed, using logarithms to facilitate the operation.

While the earth has no true geometrical figure, it is nearer that of an oblate spheriod than any other; but for about 15° each side of the equator it is more nearly spherical than elsewhere. Because of the irregularity of the earth's form, a course and distance found by both Mercator and middle latitude sailings cannot always agree exactly and neither can be absolutely correct.

In many works on navigation, the earth is considered a perfect sphere, with the result that the tables of meridional parts are more or less in error, and above latitude about 15° this error becomes some considerable, and in consequence the course and distance found by Mercator sailing is not exactly correct.

The same writers in handling middle latitude sailing, neglect a necessary correction to the mean or middle latitude, and therefore the courses and distances so obtained are also incorrect, the error being different in different latitudes.

In consequence of the above, there are certain conditions where Mercator sailing will give a more satisfactory result than the middle latitude method, and vici versa, and only in cases where the course is 45° will the result of both methods nearly correspond.

The latest edition of Bowditch contains a new table of meridional parts and a middle latitude correction which conforms very nearly with the figure of the earth, and in the solution of the following problems those tables and no others are used.

The following tables, containing all the necessary rules for the solution of the various problems, are from Bowditch:

MIDDLE LATITUDE SAILING.

Case.	Given.	To Find.	Solutions.
1	Both latitudes and longitudes.	Departure Course Distance	Dep. = D. Lo. × cos Mid. L. Tan. C. = Dep. ÷ D. L. or tan C. = (cos Mid. L. × D. Lo.) ÷ D. L. Dist. = sec C. × D. L. or Dist. = Dep. ÷ sin C.
2	Both latitudes and departure.	Course Distance Difference of longitude	Tan. C. = Dep. ÷ D. L. Dist. = Dep. ÷ sin C. D. Lo. = Dep. ÷ cos Mid. L.
3	One latitude, course and distance.	Difference of latitude Departure Difference of longitude	D. L. = Dist. × cos C. Dep. = Dist. × sin C. D. Lo. = Dep. × sec Mid. L. or (Dist. × sin C. × sec Mid. L.)
4	Both latitudes and course.	Departure Distance Difference of longitude	Dep. = D. L. × tan C. Dist. = D. L. ÷ cos C. D. Lo. = Dep. × sec Mid. L. or D. L. × tan C × sec Mid. L.
5	Both latitudes and distance.	Course Departure Difference of longitude	Cos C. = D. L. ÷ Dist. Dep. = Dist. × sin C. D. Lo. = Dep. × sec Mid. L.
6	One latitude, course and departure.	Difference of latitude Distance Difference of longitude	D. L. = Dep. ÷ tan C. Dist. = Dep. ÷ sin C. D. Lo. = Dep. × sec Mid. L.
7	One latitude, distance and departure.	Course Difference of latitude Difference of longitude	Sin C. = Dep. ÷ Dist. D. L. = Dist. × cos. C. D. Lo. = Dep. × sec Mid. L.

MERCATOR SAILING.

Case.	Given.	To Find.	Solutions.
1	Both latitudes and longitudes.	Course	Tan C. = D. Lo. ÷ m.
		Distance	Dist. = sec C. × D. L.
			Dist. = D. L. ÷ cos C.
		Departure	Dep. = D. L. × tan C.
			Dep. = (D. L. × D. Lo.) ÷ m.
2	Both latitudes and departure.	Course	Tan C. = Dep. ÷ D. L.
		Distance	Dist. = D. L. × sec C.
			Dist. = Dep. ÷ sin C.
		Difference of longitude	D. Lo. = m. × tan C.
			D. Lo. = (Dep. × m. ÷ D. L.
3	One latitude, course and distance	Departure	Dep. = Dist. × sin C.
		Difference of latitude	D. L. = Dist. × cos C.
		Difference of longitude	D. Lo. = m. × tan C.
4	Both latitudes and course.	Distance	Dist. = D. L. ÷ cos C.
		Departure	Dep. = D. L. × tan C.
		Difference of longitude	D. Lo. = m. × tan C.
5	Both latitudes and distance.	Course	Cos C. = D. L. ÷ Dist.
		Departure	Dep. = Dist. × sin C.
		Difference of longitude	D. Lo. = m. × tan C.
6	One latitude, course and departure.	Difference of latitude	D. L. = Dep. ÷ tan C.
		Distance	Dist. = Dep. ÷ sin C.
		Difference of longitude	D. Lo. = m. × tan C.
			D. Lo. = (Dep. × m.) ÷ D. L.
7	One latitude, distance, and departure.	Course	Sin C. = Dep. ÷ Dist.
		Difference of latitude	D. L. = Dist. × cos C.
		Difference of longitude	D Lo. = m. × tan C.
			D. Lo. = (Dep. × m.) ÷ D. L.

Example: Find the course and distance from Sandy Hook light ship to Port San Juan, Porto Rico.

BY MIDDLE LATITUDE SAILING

Lat. S. H. L. S.	40°	28′	00″	N.	Long. S. H. L. S.	73°	50′	00″ W.
Lat. P. S. J.	18	28	23	N.	Long. P. S. J.	66	07	26 W.
Diff lat. 1319′.6 =	21	59	37	S.	Diff. long. 462′.6 =	7	42	34 E.

In the table containing the correction to be applied to the middle latitude, the difference of latitude is limited to 20°, and in consequence it is necessary to compute the middle latitude, using the formula:

$$\text{Mid. lat.} = \frac{\text{prop. diff. lat.}}{\text{mer. diff. lat.}}$$

which will be found on page 54, Bowditch, new edition.

Lat. S. H. L. S.	40°	28′	00″	N.	Mer. Parts	2644′.2	Prop. diff. lat.	1319′.6 log. 3.12044
Lat. P. S. J.	18	28	23	N.	" "	1120.4	Mer. diff. lat.	1523.8 " 3.18292
					" diff. lat.	1523.8S	Mid. lat. 30°	= cos. 9.93752

Diff. long. 462′.6	log.	2.66521	Course S. 16° 53′ E.	sec. .01913
Mid. lat. 30°	cos.	9.93752	Prop. diff. lat. 1319′.6	log. 3.12044
Dep. 400′.6	= log.	2.60273	Distance 1379′	= log. 4.13957
Prop. diff. lat. 1319′.6	"	3.12044		
Course S. 16° 53′ E.	= tang.	9.48229		

BY MERCATOR SAILING.

Diff. long. 462′.6 E.	log.	2.66521	Prop. diff. lat. 1319′.6	log.	3.12044
Mer. diff. lat. 1523′.8 S.	log.	3.18292	Course S. 16° 53′ E.	cos.	9.98087
Course S. 16° 53′ E.	tang.	9.48229	Distance 1379′.	= log.	3.13957

The Mercator Chart and Its Use.

From the various projections upon which charts are constructed, the Mercator is selected as best meeting the requirements for the purposes of the practical navigator. The chart was first published by Gerard Mercator, a Flemish geographer, in 1569, and it seems that he never disclosed the principles upon which it was constructed. However, the Mercator charts now used are constructed on a well known theory, and fully satisfy the demands of the navigator, except for obtaining the great circle track, and this track when found is usually laid off on this chart. On account of the great difference between the degree of longitude and that of latitude, the chart is not so desirable above about 70°, and for that reason the table of meridional ports is not computed beyond 80°.

The chart is constructed on the theory that the earth's surface is a cylinder tangent to the equator. This necessitates the meridians being parallel to each other, while on the sphere they contract towards the poles. The distances between the successive parallels of latitude are increased towards the poles in the same proportion that the meridians have been expanded. It then follows that on this chart the degree of longitude is everywhere equal or of uniform length, and the degree of latitude constantly increasing in length towards the poles. The result of this is a plane chart upon which every place is in its proper geographical position, and on their proper bearings from each other. All courses and bearings are shown as straight lines, except the great circle track, which is a curve, except when the two points bear north and south from each other.

To lay off a course on this chart, draw a straight line between the two points, and to measure a distance in any direction the miles must be taken from the graduated meridian at either side of the chart in the middle latitude of the latitudes of the places or points under consideration. The miles for measuring difference of longitude is taken from the graduated parallel of latitude in any longitude at either the top or bottom of the chart. In convenient places there are true compasses, inside of each is a magnetic compass. In using these compasses, the one on the line of equal variation to which the ship is nearest must be used.

On the land portion of these charts will be found connsiderable data, such as the date to which corrected, a description of the lights, their distance visible, information of tides, unit used for soundings, abbreviations, etc. Before the chart is used it should be examined and all the data read until it is thoroughly understood. It is advisable to have any book of sailing directions, coast pilots or other information that usually go with charts and are properly a part of them. Always use the latest charts.

Thermometer.

There are three thermometer scales in general use and when a temperature is recorded the name of the scale is usually given. For various reasons it is at times necessary to convert the reading by one thermometer scale into that of another.

The Fahrenheit scale is divided into 180 equal parts, called degrees, between the freezing point and the boiling point of water. From 32° below the freezing point, which is the zero, the degrees are counted to 212° or more. The same scale is extended any convenient number of degrees below the zero.

The centigrade scale is divided into 100 equal parts between the freezing and boiling points, the freezing point being the zero from which the degrees are read each way.

The Reaumer scale is similar to the centigrade, except that it is divided into 80 equal parts between the freezing and boiling points.

By the following rules the reading of any thermometer scale may be converted into that of another:

FAHRENHEIT TO CENTIGRADE.

$$\text{Centigrade} = \frac{\text{Degrees Fahr. } @\ 32°}{9} \times 5$$

FAHRENHEIT TO REAUMER.

$$\text{Reaumer} = \frac{\text{Degrees Fahr. } @\ 32°}{9} \times 4$$

CENTIGRADE TO FAHRENHEIT.

$$\text{Fahrenheit} = \left(\frac{\text{Degrees Centi.}}{5} \times 9\right) + 32°$$

REAUMER TO FAHRENHEIT.

$$\text{Fahrenheit} = \left(\frac{\text{Degrees, Reaumer}}{4} \times 9\right) + 32°$$

CENTIGRADE TO REAUMER.

$$\text{Reaumer} = \frac{\text{Degrees Centi.}}{5} \times 4$$

REAUMER TO CENTIGRADE.

$$\text{Centigrade} = \frac{\text{Degrees Reaumer}}{4} \times 5$$

The Mariner's Compass.

SHOWING EVERY POINT AND DEGREE.

N.
N. ¼ E.
N. ½ E.
N. ¾ E.
N. by E.
N. by E. ¼ E.
N. by E. ½ E.
N. by E. ¾ E.
N. by W. ¼ W.
N. by W. ½ W.
N. by W. ¾ W.
N. ¾ W.
N. ½ W.
N. ¼ W.
NE
E.
E. ¼ S.
E. ½ S.
E. ¾ S.
E. by S.
E. by S. ¼ S.
E. by S. ½ S.
E. by S. ¾ S.
E. S. E.
E. S. E. by E. ¾ E.
E. S. E. by E. ½ E.
E. S. E. by E. ¼ E.
E. S. E. by E.
E. S. E. ¼ E.
E. S. E. ½ E.
E. S. E. ¾ E.
S. E.
S. E. ¼ S.
S. E. ½ S.
S. E. ¾ S.
S. E. by S.
S. E. by S. ¼ S.
S. E. by S. ½ S.
S. E. by S. ¾ S.
S. S. E.
S. S. E. by E. ¾ E.
S. S. E. by E. ½ E.
S. S. E. by E. ¼ E.
S. S. E. by E.
S. by E. ¼ E.
S. by E. ½ E.
S. by E. ¾ E.
S. S. E. ¼ E.
S. S. E. ½ E.
S. S. E. ¾ E.
SE
S.
S. ¼ W.
S. ½ W.
S. ¾ W.
S. by W.
S. by W. ¼ W.
S. by W. ½ W.
S. by W. ¾ W.
S. S. W.
S. S. W. by W. ¾ W.
S. S. W. by W. ½ W.
S. S. W. by W. ¼ W.
S. S. W. by W.
S. W. by W. ¼ W.
S. W. by W. ½ W.
S. W. by W. ¾ W.
S. W.
S. W. by S. ¼ S.
S. W. by S. ½ S.
S. W. by S. ¾ S.
W. S. W.
W. by S. ¾ S.
W. by S. ½ S.
W. by S. ¼ S.
W. by S.
W. ¾ S.
W. ½ S.
W. ¼ S.
W.
W. ¼ N.
W. ½ N.
W. ¾ N.
W. by N. ¼ N.
W. by N. ½ N.
W. by N. ¾ N.
W. N. W.
N. W. by W. ¾ W.
N. W. by W. ½ W.
N. W. by W. ¼ W.
N. W. by W.
N. W. ¼ W.
N. W. ½ W.
N. W. ¾ W.
N. W.
N. W. by N. ¾ W.
N. W. by N. ½ W.
N. W. by N. ¼ W.
N. W. by N.
NW
SW
W
N. E. by E. ¾ E.
N. E. by E. ½ E.
N. E. by E. ¼ E.
N. E. by E.
N. E. by N. ¾ N.
N. E. by N. ½ N.
N. E. by N. ¼ N.
N. E.

1863-1903—Forty Years of American Progress.

To the Editor of THE AMERICAN EXPORTER:

From $174,000,000 to $873,000,000 in agricultural products exported.

From $41,000,000 to $407,000,000 in manufactures exported.

From $6,000,000 to $39,000,000 in mining products exported.

From $9,000,000 to $58,000,000 in forest products exported.

From 33,000,000 to 82,000,000 population.

From $17,000,000,000 to $100,000,000,000 total national wealth.

From 2,100,000 to 6,000,000 farms.

From $8,500,000,000 to $22,000,000,000 total value of farm property.

From $1,500,000,000 to $4,500,000,000 annual value of farm products.

From 10,000,000 to 250,000,000 tons of coal produced annually.

From a few thousand to over 10,000,000 tons of steel produced.

From 23,000,000 to 2,900,000,000 gallons of petroleum produced.

From less than 1,000,000 to over 14,000,000 tons of pig iron produced.

From 7,500 to 275,000 tons of copper produced.

From less than $200,000,000 to nearly $1,100,000,000 total worth of minerals produced.

From less than 150,000 to 525,000 factories.

From less than 1,500,000 to over 6,000,000 factory workers.

From $400,000,000 to over $3,000,000,000 factory wages and salaries yearly.

From $2,000,000,000 to over $14,000,000,000 in factory products yearly.

From $47,000,000 to $82,000,000 worth of gold produced.

From a few thousand dollars to over $75,000,000 worth of silver produced.

From 4,800,000 (1860) to 10,000,000 bales of cotton produced.

From $115,000,000 (1860) to nearly $400,000,000 worth of cottons manufactured.

From $525 to $1,300 national wealth per capita.

From $1,250,000,000 to $2,500,000,000 total value of farm animals.

From $204,000,000 to $1,025,000,000 total imports.

From $243,000,000 to $1,420,000,000 total exports.

From $2,248,000,000 (1867) down to $914,000,000 public debt.

From $146,000,000 (1866) down to $25,000,000 annual interest charges.

From $4.12 (1866) down to 32 cents annual interest charge per capita.

From $25,000,000 to $782,000,000 gold and silver in the Treasury.

From $595,000,000 to $2,367,000,000 total money circulation.

From a storm-tossed, war-swept, disunited country to a peaceful, progressive, glorious united Union.

WALTER J. BALLARD.

SCHENECTADY, N. Y., U. S. A., June 12, 1904.

TABLE FOR TURNING COMPASS POINTS INTO DEGREES AND THE CONTRARY.

N. TO E.	N. TO W	POINTS	° ′ ″	S. TO E.	S. TO W.
N.	N.	0	0° 0′ 0″	S	S.
N. ¼ E.	N. ¼ W.	¼	2 48 45	S ¼ E.	S ¼ W.
N. ½ E.	N. ½ W.	½	5 37 30	S. ½ E.	S. ½ W.
N. ¾ E.	N. ¾ W.	¾	8 26 15	S. ¾ E.	S. ¾ W.
N. by E.	N. by W.	1	11 15 0	S. by E.	S. by W.
N. by E. ¼ E.	N. by W. ¼ W.	1¼	14 3 45	S. by E. ¼ E.	S. by W. ¼ W.
N. by E. ½ E.	N. by W. ½ W.	1½	16 52 30	S. by E. ½ E.	S. by W. ½ W.
N. by E. ¾ E.	N. by W. ¾ W.	1¾	19 41 15	S. by E. ¾ E.	S. by W. ¾ W.
N. N. E.	N. N. W.	2	22 30 0	S. S. E.	S. S. W.
N. E. by N. ¾ N.	N. W. by N. ¾ N.	2¼	25 18 45	S. E. by S. ¾ S.	S. W. by S. ¾ S.
N. E. by N. ½ N.	N. W. by N. ½ N.	2½	28 7 30	S. E. by S. ½ S.	S. W. by S. ½ S.
N. E. by N. ¼ N.	N. W. by N. ¼ N.	2¾	30 56 15	S. E. by S. ¼ S.	S. W. by S. ¼ S.
N. E. by N.	N. W. by N.	3	33 45 0	S. E. by S.	S. W. by S.
N. E. ¾ N.	N. W. ¾ N.	3¼	36 33 45	S. E. ¾ S.	S. W. ¾ S.
N. E. ½ N.	N. W. ½ N.	3½	39 22 30	S. E. ½ S.	S. W. ½ S.
N. E. ¼ N.	N. W. ¼ N.	3¾	42 11 15	S. E. ¼ S.	S. W. ¼ S.
N. E.	N. W.	4	45 0 0	S. E.	S. W.
N. E. ¼ E.	N. W. ¼ W.	4¼	47 48 45	S. E. ¼ E.	S. W. ¼ W.
N. E. ½ E.	N. W. ½ W.	4½	50 37 30	S. E. ½ E.	S. W. ½ W.
N. E. ¾ E.	N. W. ¾ W.	4¾	53 26 15	S. E. ¾ E.	S. W. ¾ W.
N. E. by E.	N. W. by W.	5	56 15 0	S. E. by E.	S. W. by W.
N. E. by E. ¼ E.	N. W. by W. ¼ W.	5¼	59 3 45	S. E. by E. ¼ E.	S. W. by W. ¼ W.
N. E. by E. ½ E.	N. W. by W. ½ W.	5½	61 52 30	S. E. by E. ½ E.	S. W. by W. ½ W.
N. E. by E. ¾ E.	N. W. by W. ¾ W.	5¾	64 41 15	S. E. by E. ¾ E.	S. W. by W. ¾ W.
E. N. E.	W. N. W.	6	67 30 0	E. S. E.	W. S. W.
E. by N. ¾ N.	W. by N. ¾ N.	6¼	70 18 45	E. by S. ¾ S.	W. by S. ¾ S.
E. by N. ½ N.	W. by N. ½ N.	6½	73 7 30	E. by S. ½ S.	W. by S. ½ S.
E. by N. ¼ N.	W. by N. ¼ N.	6¾	75 56 15	E. by S. ¼ S.	W. by S. ¼ S.
E. by N.	W. by N.	7	78 45 0	E. by S.	W. by S.
E. ¾ N.	W. ¾ N.	7¼	81 33 45	E. ¾ S.	W. ¾ S.
E. ½ N.	W. ½ N.	7½	84 22 30	E. ½ S.	W. ½ S.
E. ¼ N.	W. ¼ N.	7¾	87 11 15	E. ¼ S.	W. ¼ S.
E.	W.	8	90 0 0	E.	W.

"NEW JERSEY"

Elastic Seam Paint

Popular, because it is effective,
And does away with the pitch pot

Try It and be Convinced of Its Merit

HIGHEST AWARDED MEDAL
AT AMERICAN INSTITUTE OF NEW YORK CITY.
NEW JERSEY
Elastic Seam Paint
THE MOST USED. WHY? BECAUSE IT IS THE BEST.
MANUFACTURED BY
NEW JERSEY PAINT WORKS
H. LOUDERBOUGH, Proprietor,
Cor. Wayne and Fremont Streets, JERSEY CITY, N. J., U. S. A.
Cable Address, "JERSEY."

A Seam Brush Applies It over the Oakum

The advantage that it has over other Fillers is, that Copper Paint will adhere to it. Working of the Vessel does not crack it . . . . . .

New Jersey Paint Works

HARRY LOUDERBOUGH, Proprietor

JERSEY CITY, N. J., U. S. A.

The World's Commerce.

By the annual report of O. P. Austin, chief of the bureau of statistics of the department of commerce and labor, just published, we learn that the world's commerce amounts to $22,324,000,000, made up of the following:

Imports	$11,809,000,000
Exports	10,515,000,000

This world commerce of $22,000,000,000 yearly is a gigantic thing, but Uncle Sam's internal commerce, among his own family alone, equals it. This conclusion is based on the census valuation of our manufactures, agricultural products, products of the fisheries, forests, mines, etc., and adding the cost of transportation between producer and consumer. This way of figuring is conservative; in fact, it is ultra conservative, because it only includes one transaction in each article, which also, as a matter of fact, our active American way of doing business often results in many, very many, transactions in nearly all the articles. Indeed, on this basis, and as the $22,000,000,000 world commerce includes both the buying and selling of the same articles, a double transaction, it follows that Uncle Sam's internal commerce of $22,000,000,000 is really double the value of the international commerce of the world, which is really $11,000,000,000 of the single transaction basis.

Europe leads in this international commerce, both as to exports and imports. The figures are:

Exports of:	*Total.*
All Europe	$ 6,498,746,000
North America	417,206,000
South America	537,439,000
Asia	1,029,099,000
Oceanica	308,708,000
Africa	288,483,000
United States	1,435,171,000
World's exports, total	$10,514,932,000

	To U. S.
All Europe	$ 407,858,000
N & S. America	315,807,000
Asia	112,231,000
Oceanica	27,070,000
Africa	6,457,000
World's export, total	$ 870,423,000

Imports by:	*Total.*
All Europe	$ 8,301,613,000
Asia	1,001,000,000
United States	991,091,000
North America	437,476,000
South America	349,691,000
Oceanica	292,107,000
Africa	436,256,000
World's imports, total	$11,809,234,000

	From U. S.
All Europe	$ 1,202,343,000
Asia	46,781,000
N. & S. America	281,781,000
Oceanica	34,855,000
Africa	24,333,000
World's imports, total	$ 1,590,050,000

The fact that Asia imports annually over one thousand million dollars' worth of goods, of which we supply only forty-six millions, is the strongest proof which can be adduced of the wisdom of the three cardinal features of the national policy of the republican party, namely, the retention of the Philippines (with Manila as our Hong Kong), the early construction of the American Panama canal and the upbuilding of the American ocean-going marine. To the opportunity here shown for nearly a thousand million dollars more of Asiatic American exports, we can fairly add the $258,000,000 which Oceanica now buys yearly from countries other than the United States. Thus we have an increased trade of over $1,200,000,000 in sight, to say nothing of the increased total imports, and the increased liking for American goods which will undoubtedly follow the opening of the American Panama canal and the more frequent sight of the Stars and Stripes in the busy ports of the Far East.

No other country in the world has anything like such magnificent natural resources as has the United States—magnificent not only in quantity, but also in their diversity. The three policies outlined are called republican policies, and so they are, and as such they deserve the support of each and every American voter, native or foreign born. But they are more than that. They are national policies, and eminently the ones best fitted to our necessities, our opportunities and our national prestige.

—*Walter J. Ballard, in N. Y. Sun.*

TESTIMONIALS.

West New Brighton, N. Y., Nov. 14, 1901.

H. Louderbough.

Dear Sir.—We have used your New Jersey Copper Paint on our own Boats, and have sold it at our Dry Dock. It gives entire satisfaction. We have also used your Wetterstedt Copper Paint with good results.

Yours truly,

FRANK McWILLIAMS.

Port Richmond, N. Y., Nov. 14, 1901.

H. Louderbough.

Dear Sir.—The call for Red Copper Paint at my Railways is for New Jersey. Its smoothness and bright shade makes it a favorite Non-Fouling Paint.

Yours truly, D. J. JONES.

Day's Work, or Keeping Track of the Ship by Dead Reckoning.

The first course and distance is the bearing (reversed) of the point of departure and the distance off. Construct a traverse table, and in it place each course and distance sailed, and the leeway, variation and deviation. If the ship is sailing in a current, its drift and direction must be considered a course, as if the ship had really sailed it. Correct the courses for leeway, variation and deviation. With the corrected courses enter table 2, and take out the corresponding differences of latitude and departures and place them in their respective columns. Add up each column separately, and then find the differences between the latitude columns and the departure columns. The remainder of this work is explained in Middle Latitude Sailing.

Example: A ship had Barnegat light bearing S. W. by W. distance 9 miles, deviation for the ship's head 14° E. She then sailed as follows: S. E. by E. ½ E. 42 miles, deviation 3° W.; S. W. by W. 38 miles, deviation 5° E.; E. S. E. 34 miles, deviation 3° W.; S. W. 48 miles, deviation 4° E.; S. E. by E. 69 miles, deviation 3° W. On all these courses the ship made a half point leeway, and the variation of the compass is 9° W. A current ran N. E. (magnetic) at 1¾ knots per hour throughout the twenty-four hours, during which time the wind was southerly. Find the course and distance made good from Barnegat light, and the latitude and longitude in by middle latitude sailing. Then find the course and distance to Cape Hatteras light by Mercator's sailing.

TRAVERSE TABLE.

Compass Course. (Points)	Compass Course. (Degrees)	Leeway.	Var.	Dev.	Corrected Courses.	Dist. (Miles)	Diff. Lat. N.	Diff. Lat. S.	Dep. E.	Dep. W.
N. E. by E.	N. 56° 15′ E.		9° W.	14° E.	N. 61° 15′ E.	9	4.4		7.9	
S. E. by E. ½ E.	S. 61 52 E.	½ Pt.	9 W.	3 W.	S. 79 29 E.	42		8.0	41.2	
S. W. by W.	S. 56 15 W.	½ "	9 W.	5 E.	S. 57 52 W.	38		20.1		32.2
E. S. E.	S. 67 30 E.	½ "	9 W.	3 W.	S. 85 07 E.	34		3 0	33.9	
S. W.	S. 45 00 W.	½ "	9 W.	4 E.	S. 45 37 W.	48		33.3		34.5
S. E. by E.	S. 56 15 E.	½ "	9 W.	3 W.	S. 73 52 E.	69		19.0	66.3	
N. E.	N. 45 00 E.		9 W.		N. 36 00 E.	42	34.0		24.7	
							38.4	83.4	174.0	66 7
								38.4	66.7	
								45.0	107.3	

Lat. Barnegat 39° 45′ 52″ N. Long. Barnegat 74° 06′ 24″ W.
Diff. lat. 45 00 S. Diff. long 2 18 00 E.
Lat. of ship. 39 00 52 N. Long. of ship 71 48 24 W.

Lat. Barnegat 39° 45′ 52″ N.
" of ship 39 00 52 N.
2)78 46 44
Middle lat. 39 23 22 = 39° Dep. 107′.3 = diff. long. 138′ E.

Diff. lat. 45.′0 S. } = Course S. 67° E., dist. 116 miles.
Dep. 107. 3 E. }

Lat. of ship 39° 00′ 52″ N. Mer. Parts 2531.8 N. Long. of ship 71° 48′ 24″ W.
" C. Hatteras 35 15 17 N. " " 2249.4 N. " C. Hatteras 75 31 16 W.
Diff. lat. 225′.6 = 3 45 35 S. " diff. lat. 282.4 S. Diff. long. 222′.9 = 3 42 52 W.

Mer. diff. lat. 282.4 S. } = Course S. 38° W.
Diff. long. 222.9 W. }

Proper diff. lat. 225′.6 = dist. 236.5 miles.

Example: A ship had Montauk Point light bearing N. W. by N. distance 12 miles, and then sailed as follows: S. by W. 17 miles, S. S. E. 28 miles, E. N. E. 42 miles, W. N. W. 44 miles. The variation of the compass is 11° W. throughout. A current set E. N. E. (magnetic) at ¾ knots per hour throughout the twenty-four hours. Find the course and distance made good from Montauk Point, and the latitude and longitude in by middle latitude sailing. Then by Mercator's sailing, find the course and distance to Five Fathom Bank Light Ship.

Do you know that the Sun never sets on the American Flag, and that "New Jersey" Copper Paint encircles the world?

TRAVERSE TABLE.

Compass Course. (Points)	Compass Course. (Degrees)	Lee-way.	Var.	Dev.	Corrected Courses.	Dist. (Miles)	Diff. Lat. N.	Diff. Lat. S.	Dep. E.	Dep. W.
S. E. by S.	S. 34° E.		11° W.		S. 45° E.	12		8.5	8.5	
S. by W.	S. 11 W.		11 W.		S.	17		17.0		
S. S. E.	S. 22 E.		11 W.		S. 33 E.	28		23.5	15.2	
E. N. E.	N. 67 E.		11 W.		N. 56 E.	42	23.5		34.8	
W. N. W.	N. 67 W.		11 W.		N. 78 W.	44	9.1			43.0
E. N. E.	N. 67 E.		11 W.		N. 56 E.	18	10.1		14.9	
							42.7	49.0	73.4	43.0
								42.7	43.0	
								6.3	30.4	

Lat. Montauk Pt. 41° 04′ 16″N. Long. Montauk Pt 71° 51′ 27″W.
Diff. lat. 6 18 S. Diff. long. 40 12 E.
Lat. of ship 40 57 56 N. Long. of ship 71 11 15 W.

Lat. Montauk Pt. 41° 04′ 16″N.
Lat. of ship 40 57 56 N.
2)82 02 12
Middle lat. 41 01 06=41° Dep. 30′.4=diff. long. 40′.2 E.

Diff. lat 6′.3 S.
Dep. 30′.4 E. } =Course S. 78° E., dist. 31 miles.

Lat. of ship 40° 57′ 56″ N. Mer. Parts 2683′.9 N. Long. of ship 71° 11′ 15″W.
Lat. F. F. B. L. ship 38 47 20 N. " " 2513 .8 N. Long. F. F. B. L. ship 74 34 36 W.
Diff. lat. 130′.6= 2 10 36 S. " diff. lat. 170 .1 S. Diff. long. 203′.3 = 3 23 21 W.

Mer. diff. lat. 170′.1 S.
Diff. long. 203′.3 W. } =Course S. 50° W

Proper diff. lat. 130′.6=dist. 203 miles.

Latitude by Meridian Altitude of the Sun.

Observe an altitude of the sun when on the meridian and correct it for instrumental error, semi-diameter, dip, refraction, and parallax. The result will be the true altitude, and must be subtracted from 90° to get the zenith distance which is named contrary to the sun's bearing.

Turn the longitude by account into time, and the result will be the Greenwich apparent time from noon.

From page 1 (of the month) in the nautical almanac take the sun's declination and multiply the hourly difference by the Greenwich apparent time from noon and the product will be the correction to be applied to declination as follows:

In west longitude, declination increasing, add; decreasing, subtract.

In east longitude, declination increasing, subtract; decreasing, add.

If the zenith distance and declination are of same name, add them together, and the result will be the latitude. If zenith distance and declination are of different name, subtract the lesser from the greater and the remainder will be the latitude, which takes the name of the greater.

Example: April 17, 1902. The observed meridian altitude of the sun's lower limb was 75° 12′ 20″ S. Longitude by account 67° 30′ W. Index correction 4′ 10″ +. Height of eye 45 feet.

Obs. alt. L. L.	75°	12′	20″ S.	Dec.	10°	14′	32″N.
I. C.	+	4	10	Cor.	+	3	59
	75	16	30	Cor. dec.	10	18	31
Semi-diam.	+	15	57				
	75	32	27				
Dip	—	6	36				
	75	25	51				
Ref.	—		16				
	75	25	35				
Par.	+		02				
True alt.	75	25	37				
	90	00	00				
Zen. dist.	14	34	23 N.				
Cor. dec.	+10	18	31 N.				
Lat.	24	52	54 N.				

H. D. 53″.02
Long. 67° 30′ W. = × 4h.5
26510
21208
3′ 59″ = 238″.590

Example: October 20, 1902. The observed meridian altitude of the sun's lower limb was 73° 11′ 14″ N. Longitude by account 16° 30′ E. Height of eye 40 feet.

Obs. alt. L. L.	73°	11′	14″	N.
Semi-diam.	+	16	05	
	73	27	19	
Dip	−	6	12	
	73	21	07	
Ref.	−		18	
	73	20	49	
Par.	+		02	
True alt.	73	20	51	
	90	00	00	
Zen. dist.	16	39	09	S.
Cor. dec.	+10	05	03	S.
Lat.	26	44	12	S.

Dec.	10°	06′	03″ S.
Cor.	−	1	00
Cor. dec.	10	05	03

H. D. 54″.11
Long. 16° 30′ = 1h.1
5411
5411
1′ 00″ = 59.521

Example: December 3, 1902. The observed meridian altitude of the sun's lower limb was 62° 09′ 06″ S. Longitude by account 52° 30′ E. Height of eye 39 feet.

Obs. alt. L. L.	62°	09′	06″	S.
Semi-diam.	+	16	15	
	62	25	21	
Dip	−	6	12	
	62	19	09	
Ref.	−		31	
	62	18	38	
Par.	+		04	
True alt.	62	18	42	
	90	00	00	
Zen. dist.	27	41	18	N
Cor. dec.	−21	59	41	S.
Lat.	5	41	37	N.

Dec.	22°	00′	58″ S.
Cor.	−	1	17
Cor. dec.	21	59	41

H. D. 21″.92
Long. 52° 30′ = × 3.5
10960
6576
1′ 17″ = 76.720

Example: March 21, 1902. The observed meridian altitude of the sun's lower limb was 56° 52′ 50″ N. Longitude by account 37° 30′ W. Height of eye 26 feet.

Obs. alt. L. L.	56°	52′	50″	N.
Semi-diam.	+	16	04	
	57	08	54	
Dip	−	5	00	
	57	03	54	
Ref.	−		38	
	57	03	16	
Par.	+		05	
True alt.	57	03	21	
	90	00		
Zen. dist.	32	56	39	S.
Cor. dec.	−	1	19	N.
Lat.	32	55	20	S.

Dec.	00°	01′	09″	S.
Cor.	−	2	28	
Cor. dec.		1	19	N.

H. D. 59″.22
Long. 37° 30′ W. = × 2n.5
29610
11844
2 28″ = 148.050

NOTICE TO THE MARINE TRADE.

The manufacturing business formerly conducted by R. F. SEAMAN, at 130 & 132 Bay Street, Jersey City, N. J., consisting of the following brands of Marine Paint:

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Longitude by Chronometer (Sun).

Observe an altitude not less than 12° when the sun is on or as near the prime vertical as possible, and note the time by a chronometer. Correct the altitude for instrumental error, semi-diameter, dip, refraction and parallax, and apply the error and rate of the chronometer to the time noted, and the result will be the Greenwich mean time of observation.

From the nautical almanac (page 2 of the month) take the sun's declination and hourly difference. If the Greenwich mean time is P. M., multiply the hourly difference by it, and the product will be the correction to be added to the declination if increasing; and subtracted if decreasing.

If the Greenwich mean time is A. M., it must be subtracted from twelve hours, which will give the time from noon, and with it multiply the hourly difference, and the product will be the correction to be subtracted from the declination, if increasing, and added if decreasing; and the result will be the correct declination.

Correct the equation of time by the same method used in correcting the declination.

Bring the latitude up by dead reckoning from the last observation to the time the altitude was observed.

If the latitude and declination are of the same name, subtract the declination from 90°. If the latitude and declination are of different name, add the declination to 90° and the result will be the polar distance.

From half the sum of the true altitude, latitude and polar distance, subtract the true altitude.

From table 44 take the log. secant of the latitude; log. cosecant of the polar distance; log. cosine of the half sum and log. sine of the remainder, and their half sum will be the log. sine of apparent time at ship when the observation was obtained. If the observation was taken in the morning, take this time from the A.M. column. If taken in the afternoon, take the time from the P.M. column. To this time apply the equation of time as directed (on page 1) in the nautical almanac, and the result will be the local mean time. The difference between this time and the Greenwich mean time, will be the longitude of the ship in time, and this is turned into degrees, etc., and is named by the following rule:

Greenwich time best, Longitude is west.

Greenwich time least, Longitude is east.

Example: February 8, 1902. A. M. The observed altitude of the sun's lower limb was 15° 10′ 00″. Time by chronometer 1h 28m 04s P.M., and fast 2m 06s. Latitude by account 19° 54′ N. Height of eye 26 feet.

Obs. alt. L. L.	15° 10′ 00″	Dec.	15° 11′ 28″ S.
Semi-diam.	+ 16 14	Cor.	− 1 06
	15 26 14	Cor. dec.	15 10 22
Dip	− 5 00		90 00 00
	15 21 14	P. D	105 10 22
Ref.	− 3 29		
	15 17 45		
Par.	+ 08		
True alt.	15 17 53		

H. D.	47″.14
G. M. T.	× 1.4
	18856
	4714
1′ 06″ =	65.996

Chro.	1h 28m 04s P. M.	E of T.	14m 21s.53
Fast.	− 2 06	Cor.	+ .17
G. M. T.	1 25 58 = 1h.4	Cor. E. of T.	14 21.70

H. D.	0s.12
G. M. T.	× 1.4
	48
	12
0s.17 =	.168

Alt.	15° 17′ 53″		
Lat.	19 54 00	Sec.	.02674
P. D.	105 10 22	Cosec	.01541
	2)140 22 15		
½ sum	70 11 07	Cos.	9.53017
Alt.	15 17 53		
Rem.	54 53 14	Sin.	9.91276
			2)19.48508
App. time.	7h 31m 36s = Sin.		9.74254
Tab. cor.	− 03		
L. A. T.	7 31 33		5h = 75°
Eq. time.	+ 14 22		40m = 10
L. M. T.	7 45 55 A. M.		08s = 00′ 45″
G. M. T.	1 25 58 P. M.		Long 85 00 45 W
Long.	5 40 03 W.		

Example: May 16, 1902. P. M. Longitude by account 19° 12′ W. The observed meridian altitude of the sun's lower limb was 58° 19′ 20″ N. The ship then sailed 28 miles S. 86° W. Variation 21° W. Deviation 6° E. The observed altitude of the sun's lower limb was then 10° 50′. Time by chronometer 6h 09m 06s P. M. The sun's bearing by compass was S. 127° 30′ W. I. C. 4′30″—. Height of eye 40 feet. Find latitude and longitude at time of both observations, and the deviation of the compass.

Obs. mer. alt. L. L.	58°	19′	20″	N.
I. C.	—	4	30	
	58	14	50	
Semi-diam.	+	15	50	
	58	30	40	
Dip	—	6	12	
	58	24	28	
Ref.	—		36	
	58	23	52	
Par.	+		04	
True alt.	58	23	56	
	90	00	00	
Zen. dist.	31	36	04	S.
Cor. dec.	—18	57	27	N.
Lat. at noon.	12	38	37	S.
Diff. lat.	+	9	06	S.
Lat. P. M. obs.	12	47	43	S.

Dec.	18°	56′	41″ N.
Cor.	+		46
Cor. dec.	18	57	27 N.

H. D. 35″.16
Long. 19° 12′ = ×1h.3
10548
3516
46″ = 45.708

Compass Course.	Var.	Dev.	Cor. Course.	Dist.	Diff. lat. N.	Diff. lat. S.	Dep. E.	Dep. W.
S. 86° W.	21° W.	6° E.	S. 71° W.	28		9.1	26.5	

Obs. alt. L. L.	10°	50′	00″	
I. C.	—	4	30	
	10	45	30	
Semi-diam.	+	15	50	
	11	01	20	
Dip	—	6	12	
	10	55	08	
Ref.	—	4	51	
	10	50	17	
Par.	+		09	
True alt.	10	50	26	

Dec.	18°	56′	43″ N.
Cor.	+	3	38
Cor. dec.	19	00	21
	90	00	00
P. D.	109	00	21

H. D. 35″.16
G. M. T. = × 6h.2
7032
21096
3′ 38″ = 217.992

E. of T.	3m	48s.52	
Cor.		00 .14	
Cor. E. of T.	3	48 .38	

H. D. 0s.023
G. M. T. × 6h.2
046
138
0s.14—426

Alt.	10°	50′	26″	
Lat.	12	47	43	
P. D.	109	00	21	
	2)132	38	30	
½ sum	66	19	15	
Alt.	10	50	26	
Rem.	55	28	49	

	4h	54m	24s	P. M.	= Sin.
Tab. cor.	+		02		
L. A. T.	4	54	26		
Eq. time	—	3	48		
L. M. T.	4	50	38	P. M.	
G. M. T.	6	09	06	P. M.	
Long.	1	18	28	W.	

Sec.	.01092
Cosec.	.02435
Cos.	9.60381
Sin.	9.91589
	2)19.55497
	9.77748

1h = 15°
18m = 4 30′
28s. = 7 00″

Long. P. M.	19	37	00 W.
Diff. long.	—	27	E.
Long. noon.	19	10	00 W.

P. D.	109°	00′	21″	Sec.	.01093
Lat.	12	47	41	Sec.	.00781
Alt.	10	50	26		
	2)132	38	28		
½ sum	66	19	14	Cos.	9.60388
P. D.	109	00	21		
Diff.	42	41	07	Cos.	9.86635
					2)19.48897
½ true az.	56°	16′	=	Cos.	9.74448

½ true az.	56° 16′
	× 2
True az.	S. 112 32 W.
Com. az.	S. 127 30 W.
Com. error	14 58 W.
Var.	— 21 00 W.
Dev.	6 02 E.

Yacht Specialties

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Yacht Green Copper Paint,
Yacht White and Black Paint.

Example: March 17, 1902, A. M. The observed altitude of the sun's lower limb was 18° 17′ 20″. Time by chronometer 11h 11m 21s A. M., and was slow 56m 46s. After taking this observation, the ship sailed N. 17° E., var. 6° W., dev. 12° E., a distance of 28 miles, and then the observed meridian altitude of the sun's lower limb was 59° 48′ 10″ S. Longitude by account 67° 46′ W. I. C.—6′ 40″. Height of eye 38 feet. Find the latitude and longitude at the time of both observations.

Chro.		11h	11m	21s A. M.
Slow	+		56	46
G. M. T.		00	08	07 P. M.

Obs. alt.		18°	17′	20″
I. C.	—		6	40
		18	10	40
Cor.	+		6	57
True alt.		18	17	37

Dec.	1°	36′	05″ S.
Cor.	—		06
Cor. dec.	1	35	59
	90	00	00 N.
P. D.	91	35	59

Eqa. of time		8m 43s	.12
Cor.	—		.07
Cor. eqa. time		8 43	.05

H. D.	59″.25
G. M. T.	× 0h.1
Cor. 6″	— 5.925

H. D.	0s.723
G. M. T.	× 0h.1
Cor. 0s.07	— .0723

Obs mer. alt.		59°	48′	10″ S.
I. C.	—		6	40
		59	41	30
Cor.	+		9	22
True alt.		59	50	52
		90	00	00
Zen. dist.		30	09	08 N.
Cor. dec.		— 1	31	30 S.
Lat. noon.		28	37	38 N.
Diff. lat.	—		25	48 S.
Lat. A. M. obs.		28	11	50 N.

Dec.	1°	35′	56″ S.
Cor.	—	4	26
Cor. dec.	1	31	30

H. D.	59″.22
Long. 67° 46′ W. =	× 4h.5
	29610
	23688
Cor. 4′ 26″	— 266.490

Com. Course.	Var.	Dev.	Cor Course.	Dist.	Diff. lat. N.	Diff. lat. S.	Dep. E.	Dep. W.
N. 17° E.	3° W.	12° E.	N. 23° E.	28′	25′.8		10′.9	

Lat. A. M.	28°	12′	N.
Lat. noon.	28	37	N.
	2)56	49	
Mid. lat.	28	24	— 28° Dep 10′.9 E.—diff. long. 12′.3 E.

Alt.	18°	17′	37′
Lat.	28	11	50′
P. D.	91	35	59
	2)138	05	26
½ sum	69	02	43
Alt. —	18	17	37
Rem.	50	45	06

Sec.	.05487	
Cosec.	.00017	
Cosin.	9.55343	
Sin.	9.88897	
	2)19.49744	
Sin.	9.74872	

	7h	27m	12s	=
Tab. cor.	—		02	
L. A. T.	7	27	10	A. M.
Eq. time	+	8	43	
L. M. T.	7	35	53	A. M.
G. M. T.	00	08	07	P. M.
Long. A. M. obs.	4	32	14	W.

4h	= 60°			
32m	=	8	00′	
14s	=		3	30″
Long. A. M. obs.		68	03	30 W.
Diff. long.	—		12	18 E.
Long. noon.		67	51	12 W.

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Example: March 21, 1902, A. M. The observed altitude of the sun's lower limb was 35° 17′ 30″. Time by chronometer 1h 20m 30s P. M., and fast 3m 00s. Latitude by account 00° 00′ 00″. Height of eye 40 feet.

Obs. alt. L. L.	35°	17′	30″
Semi-diam.	+	16	04
	35	33	34
Dip	—	6	12
	35	27	22
Ref.	—	1	22
	35	26	00
Par.	+		07
True alt.	35	26	07

Dec.	00°	01′	16″N.
Cor.	—	1	16
Cor. dec.	00	00	00
	90	00	00
P. D.	90	00	00

H. D.	59″.23
G. M. T.	= ×1h.29
	53307
	11846
	5923
1′ 16″	= 76.4067

Chro.	1h	20m	30s	P. M.
Fast.	—	3	00	
G. M. T.	1	17	30	P. M

E. of T.	7m	32s	.09
Cor.	—		.97
Cor. E. of T.	7	31	.12

H. D.	0s.754
G. M. T.	×1h.29
	6786
	1508
	754
	.97266

Alt.	35°	26′	07″
Lat.	00	00	00
P. D.	90	00	00
2)	125	26	07
½ sum	62	43	03
Alt.	35	26	07
Rem.	27	16	56

Sec.	.00000
Cosec.	.00000
Cos.	9.66123
Sin.	9.66123
	2)19.32246
Sin.	9.66123

L. A. T.		8h	21m	44s	=
Eq. time	+		7	31	
L. M. T.		8	29	15	A. M.
G. M. T.		1	17	30	P. M.
Long.		4	48	15	W.

4h	=	60°	
48m	=	12	00′
15s	=	3	45″
Long.		72	03 45 W.

To find the longitude by the above observation, it is only necessary to correct the altitude and subtract it from 90° and the result will be the hour angle in degrees, etc. This turned into time will be the local apparent time if observation is P. M. If A. M., subtract from 12h 00m 00s and the result will be the local apparent time. Apply the equation of time and proceed to find the longitude.

True alt.	35°	26′	07″ E.
	90	00	00
Zen. dist.	54	33	53

54°	=	3h	36m
33′	=		2 12s
53″	=		4
H. A.		3	38 16
		12	00 00
L. A. T.		8	21 44
Eq. time	+		7 31
L. M. T.		8	29 15 A. M.
G. M T.		1	17 30 P. M.
Long.		4	48 15 W.

DON'T FAIL

To examine our Two Century Calendar in the back of this book, which runs from 1801 to 2003; it is very cleverly constructed and is copyrighted.

"New Jersey" Marine Paints

Are bargains to the consumers; a bargain does not consist of what you pay but what you get.

The following example shows that it does not matter which polar distance is used when the observation is taken on the equator.

Example: June 16, 1902, P. M. The observed altitude of the sun's lower limb was 21° 17′ 20″. Greenwich mean time 10h 10m 35s P. M. Latitude 00° 00′ 00″. Dip 35 feet.

USING SOUTH POLAR DISTANCE.

Obs. alt. L. L.	21°	17′	20″	Dec.	23°	19′	50″ N.	H. D.		6″.08
Semi.-diam.	+	15	46	Cor.	+	1	02	G. M. T.		×10.2
	21	33	06	Cor dec.	23	20	52			1216
Dip	−	5	48		90	00	00			608
	21	27	18	P. D.	113	20	52	1	02″	−62″.016
Ref.	−	2	27							
	21	24	51							
Par.	+		8	E. of T.		0m	15s .50	H. D.		0s.528
True alt.	21	24	59	Cor.	+		5 .38	G. M. T.		×10.2
				Cor. E of T.		0	20 .88			1056
										528
										−5.3856

Alt.	21°	24′	59″		
Lat.	00	00	00	Sec.	.00000
P. D.	113	20	52	Cosec.	.03710
	2)134	45	51		
½ sum	67	22	55	Cos.	9.58499
Alt.	21	24	59		
Rem.	45	57	56	Sin.	9.85668
					2)19.47877
	4h	26m	16 −	Sin.	9.73938
Tab.cor.	−		02		
L. A. T.	4	26	14		
Eq. time	+		21	5h	= 75°
L. M. T.	4	26	35 P. M.	44m	= 11 00′
G. M. T.	10	10	35 P. M.	Long.	86 00 W.
Long.	5	44	00 W.		

USING NORTH POLAR DISTANCE.

Alt.	21°	24′	59″					Cor. dec.	23°	20′ 52″ N.
Lat.	00	00	00	Sec.		.00000			90	00 00
P. D.	66	39	08	Cosec.		.03710		P. D	66	39 08
	2)88	04	07							
½ sum	44	02	03	Cos.		9.85668				
Alt.	21	24	59							
Rem.	22	37	04	Sin.		9.58499				
						2)19.47877				
	4h	26m	16 −	Sin.		9.73938				
Tab. cor.	+		02							
L. A. T.	4	26	14							
Eq. time	+		21	5h	−	75°				
L. M. T.	4	26	35 P. M.	44m	−	11 00′				
G. M. T.	10	10	35 P. M.	Long.		86 00 W.				
Long.	5	44	00 W.							

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are not cheap, but just right in price to be right in quality. We value the reputation of our goods more than we do our entire plant; reputation may bring the first order, but quality must bring the succeeding ones.

Longitude by Sunset and Sunrise.

With the naked eye, a piece of colored glass or a telescope, observe the sun's limb to touch the horizon and note the time by chronometer, and apply its rate to the time noted. In this observation, the altitude is a negative quantity and is found by adding the dip to the refraction for 0° altitude and to the result add the semi-diameter and subtract parallax if the upper limb is observed; but subtract the semi-diameter and parallax if the lower limb is observed. From the sum of the latitude by account and the polar distance subtract the negative altitude, divide the result by two, which will give the half sum, and to it add the negative altitude to get the remainder. From here this calculation is the same as any chronometer sight of the sun.

Example: March 10, 1902. **The sun's lower limb was observed on the horizon at setting. Time** by chronometer 10h 40m 49s P. M. Latitude by account 35° 17′ N. Height of eye 40 feet.

Ref. alt. 0°		36′	29″	Dec.	4°	21′	24″ S.	H. D.			58″.7
Dip	+	6	12	Cor.	—	10	28	G. M. T.			× 10 .7
		42	41	Cor. dec.		4	10	56			4109
Semi-diam.	−	16	07			90	00	00			587
		26	34	P. D.		94	10	56	10′ 28′	−	628.09
Par.	−		9								
Neg. alt.		26	25	Equ. of time			10m.	37s.98	H. D.		0s.638
				Cor.		—		6 .83	G. M. T.		× 10 .7
				Cor. E. of time			10	31 .15			4466
											638
									6s.83	−	6.8266

Lat.	35°	17′	00″	Sec.	.06815
P. D.	94	10	56	Cosec.	.00116
	129	27	56		
Neg. alt.	−	26	25		
	2)129	01	31		
½ sum	64	30	45	Cos.	9.63378
Neg. alt.	+	26	25		
Rem.	64	57	10	Sin.	9.95711
					2)19.68020
App. time		5h.	50m.	16s. − Sin.	9.84010
Tab. cor.	+			2	
L. A. T.		5	50	18	
Eq. time	+		10	31	
L. M. T.		6	00	49 P. M.	4h = 60° 00′
G. M. T.		10	40	49 P. M.	40m = 10 00 00″
Long.		4	40	00 W.	Long. 70 00 00 W.

Example: March 8, 1902. The sun's upper limb was observed on the horizon at setting. Time by chronometer 10h 56m 31s P. M., and slow 3m 15s. Latitude by account 37° 15′ 00″ N. Height of eye 40 feet.

Ref. alt.	0°		36′	29″	Dec.	5°	08′	14″.9	S.	H. D.	58″.39
Dip		+	6	12	Cor.	—	10	42 .3		G. M. T.	× 11h
			42	41	Cor. due.		4	57	32 .6	S.	5889
Semi. diam.		+	16	08			90	00	00 0		5839
			58	49	P. D.		94	57	32 .6	Cor. 10′ 42″.3	= 642″.29
Par.		−		09							
Neg. alt.			58	40							

Chro. time	10h	56m	31s	P. M.	Equ. of time		11m.	07s.88	H. D.	0s.607
Slow	+	3	15		Cor.	−		6.68	G. M. T.	× 11h
G. M. T.	10	59	46	P. M.	Cor. equ. of time		11	01.20		607
										607
									Cor. 6s.68	= 6s.677

Lat.	37°	15′	00″	Sec.	.09909	
P. D.	94	57	33	Cosec.	.00163	
	132	12	33			
Neg. alt.	−	58	40			
	2)131	13	53			
	65	36	56	Cos.	9.61580	
Neg. alt.	+	58	40			
Rem.	66	35	36	Sin.	9.96270	
					2)19.67922	
		5h	49m	52s = Sin.	9.83961	
Tab. cor.		−		03		
L. A. T.		5	49	49 P. M.		
Equ. of time		+	11	01	4h = 60°	
L. M. T.		6	00	50 P. M.	58m. = 14 30′	
G. M. T.		10	59	46 P. M.	56s. = 14 00′	
Long.		4	58	56 W.	Long. 74 44 00 W.	

Example: November 27, 1902. The sun's upper limb was observed on the horizon at rising. Time by chronometer 6h 08m 16s A. M., and slow 8m 14s. Height of eye 30 feet. Latitude by account 30° 30′ 30″ S. Find the longitude at time of observation, and from that position find the course and distance to Cape of Good Hope light by Mercator and middle latitude sailing.

Ref. alt. 0°		36′	23″	Dec.	21°	00′	53″ S.	H. D.	28′.06
Dip		5	22	Cor.	—	2	40	H. A.	= × 5h.7
Semi. diam.	+	16	14	Cor. due.	20	58	13 S.		19642
		58	05		90	00	00		14030
Par.	—		09	P. D.	69	01	42	Cor. 2′ 40″ =	159.942
Neg. alt.		57	56						

Chro. time	6h	08m	16s A. M.	Exu. of time		12m	30s.32	H. D.	0s.807
" slow	+	8	14	Cor.	+		4.60	H. A.	= × 5h.7
G. M. T.	6	16	30	Cor. E. of time	=	12	34.92		5649
	12	00	00						4035
H. A. 5h.7	= 5	43	30					Cor. 4s.60 =	4.5999

Lat.	30°	30′	30″	Sec	.06472
P. D.	69	01	42	Cosec.	.02577
	99	32	12		
Neg. alt.	—	57	56		
	2) 98	34	16		
½ sum	49	17	08	Cos.	9.81444
Neg. alt.	+	57	56		
Rem.	50	15	04	Sin.	9.88585
					2)19.79478
	5h	02m	48s	= Sin.	9.89739
Tab. cor.	+		03		
L. A. T.	5	02	51 A. M.	1h	= 15°
Eq. time	—	12	35	26m	= 6 30′
L. M. T.	4	50	16 A. M.	14s	= 3 30′
G. M. T.	6	16	30 A. M.		
Long.	1	26	14 W.	Long.	= 21 33 30 W.

MERCATOR SAILING

Lat. Ship	30°	30′	30″	S.	Mer. parts	1911.8		Long. ship	21° 33′ 30″ W.	
" C. G. H. L.	34	21	12	S.	" "	2183.9		" C. G. H. L.	18 29 26 E.	
Diff. lat. 230′.7	= 3	50	42	S.	Mer. diff. lat.	= 272.1	S.	Diff. long. 2402′.9	= 40 02 56 E.	

Diff. long.	2402′.9 E.	log.	3.38073	Prop. diff. lat. 230′.7	log.	2.36305
Mer. diff. lat.	272′.1 S.	"	2.43173	Course S. 83° 32′ E.	cos.	9.05164
Course S. 83° 32′ E.		= tang.	.94600	Distance 2048′.4	= log.	3.31141

MIDDLE LATITUDE SAILING.

Lat. ship	30°	30′	30″	Diff. long.	2402′.9 E.	log.	3.38073	Course S. 83° 32′ E.	sec. .94836
" C. G. H. L.	34	21	12	Mid. lat. 32° 07′ 51″		cos.	9.92835	Prop. diff. lat. 230′.7	log. 2.36305
	2)64	51	42	Dep. 2037′.4		= log.	3.30908	Distance 2048′.4	= " 3.31141
Mean lat.	= 32	25	51	Prop. diff. lat. 230′.7	S.	"	2.36305		
Correction	—	25	00	Course S. 83° 32′ E.		= tang.	.94603		
Mid. lat.	= 32	00	51						

Norfolk, Va., Oct. 10, 1901.

Mr. H. Louderbough.

Dear Sir.—After a trial of many years at our Shipyard and Railways at Norfolk, Va., your "New Jersey" Copper Paint has stood the test of many trials, and proved itself to be the best Anti-Fouling Paint ever used in the waters of our bay, and for years I have only carried your brand in stock, and many patrons that I have induced to try it, all express themselves as being well pleased with the results of such trials.

CHAS. J. COLONNA.

Jersey City, N. J., Nov. 14, 1901.

Mr. H. Louderbough.

Dear Sir.—Your Red Copper Paint is very popular with both yachtsmen and fishermen; we have applied a large quantity at our yard with satisfaction to all. Your New Jersey Brown Copper is also a favorite with schooner captains. Very truly yours,

DOWNING & LAWRENCE DRY DOCK CO.

Perth Amboy, N. J., Nov. 25, 1901.

At our Dry Docks we have been for years large users of your New Jersey brands of Copper Paint, Mixed Paints, Seam Paint and Perfect Ship Black, and our consumption of these Paints shows plainly our appreciation and that of our customers for your productions of Paints. We remain, yours truly,

PERTH AMBOY DRY DOCK CO.

Norfolk, Va., Oct. 20, 1901.

Mr. H. Louderbough.

Dear Sir.—In our Ship Chandlery business, at this port, we have handled several copper paints, but in recent years, through the great demand we received for your "New Jersey" Copper Paint, we have given up all other brands, and now only sell your brand of Paint. Endorsements of its quality are frequently given in by those who have given it repeated trials. In our experience of ten (10) years, we have never had a can returned with complaint.

Yours truly, J. M. JORDAN & CO.

"NEW JERSEY"

National Export Exposition Medal.

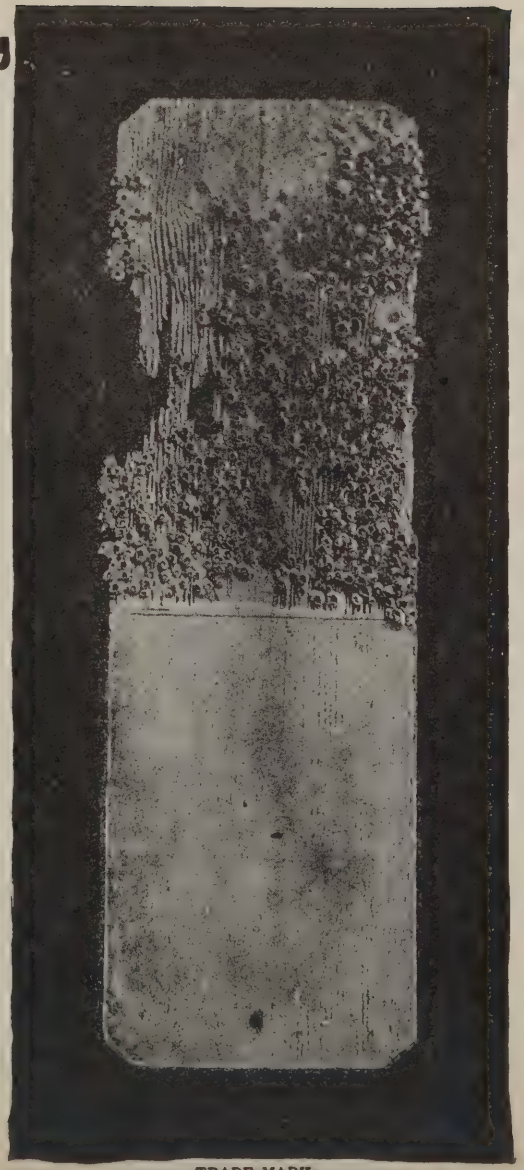
REMARKABLE FACT.

THIS cut is a copy of a photograph of a board having one end painted with **"NEW JERSEY" COPPER PAINT,** manufactured by Harry Louderbough, proprietor of NEW JERSEY PAINT WORKS, Jersey City, N. J., U. S. A., and placed in the water at Port Royal, S. C., for five months. Upon the unpainted end you can note the ravages of the salt water worm so destructive to wood, and also the large number of barnacles that have fastened upon it. Observe the painted end, where **"New Jersey" Copper Paint** was applied—its splendid condition.

The board here represented was placed in the water at Port Royal, S. C., by me, and left in the water five months. The painted end was as good as when it was placed in the water.

MILLS EDWARD,
Master Schooner "Florence Shay."

ONLY ONE BRAND AND THAT THE BEST.



TRADE MARK.
COPYRIGHTED IN EUROPE.

COPPER PAINT.

American Institute Medal.

OUR MARINE PAINT

SPECIALTIES:

"NEW JERSEY"

- **Copper Paint,**
- **Red Copper Paint,** FOR YACHTS,
- **Elastic Seam Paint,**
- **Yacht Black,**
- **Yacht White,**
- **Mast Paint,**
- **Smoke Stack Paint,**
- **Ship and Deck Paint.**

The American Institute of New York has awarded us the highest attainable Medal for our "New Jersey" Copper Paint, Seam Paint and Pile Preservative Paint.

NEW JERSEY PAINT WORKS,

HARRY LOUDERBOUGH, Prop.

JERSEY CITY, N. J., U. S. A.

Longitude and Latitude by Equal Altitudes.

Example: April 29, 1902. In latitude 31° 18′ 30″ N. by account, the following equal altitudes of the sun's lower limb were observed. A. M. altitude 72° 47′ S., and time by chronometer 4h 14m 10s P. M. P. M. altitude 72° 47′ S., and time by chronometer 4h 27m 06s P. M. Height of eye 37 feet.

(LONGITUDE.)

Chro. A. M. obs.	4h.	14m.	10s.	P. M.
" P. M. "	4	27	06	P. M.
2)	8	41	16	
Mid. chro. time	4	20	38	
Eq. of time	+	2	39	
Long.	4	23	17	W.

Eq. T.	2m.	37s.12	
Cor.	+	1 .60	
Cor. Eq. T.	2	38 .72	

4h.	=	60°	
23m.	=	5	45′
17s.	=		4 15″
Long.		65	49 15 W.

H. D.	0s.373
G. M. T.—	×4.3
	1119
	1492
	1.6039

(LATITUDE.)

Obs. alt. L. L.	72°	47′	00″	S.
Semi-diam.	+		15	54
	73	02	54	
Dip	—		05	48
	72	57	06	
Ref.				18
	72	56	48	
Par.	+			2
	72	56	50	
Cor.	+		3	56
True mer. alt.	73	00	46	
	90	00	00	
Zen. dist.	16	59	14	N.
Cor. dec.	14	18	51	N.
Lat.	31	18	05	N.

Dec.	14°	15′	20″ N.
Cor.	+	3	31
Cor. dec.	14	18	51

H. D.	46.″98
G. M. T.	× 4.5
	23490
	18792
3′ 31″ —	211.410

Chro. A. M. obs.	4h.	14m.	10s.
" P. M. "	4	27	06
Diff.	2) 0	12	56
H. A. 6m.5 —		6	28

H. A.	6m. 5² —	42.2
Table 26		× 5.6
		2532
		2110
Cor.	3′ 56″ —	236″ .32

That part of this calculation by which the latitude is found, is commonly known as ex-meridian.

Latitude by Ex-Meridian Altitudes.

By this method, the latitude may be obtained when on account of cloudy weather the meridian altitude cannot be observed, as is often the case. While there are a number of tables published for the solution of this calculation, experience has proven that none are so reliable, simple, and convenient for the use of the navigator as that given here from Bowditch. Some of the others are more or less complicated and can only be used by those who use them very frequently, and navigators should in all cases select the most simple and convenient correct methods for the determination of latitude, longitude, etc.

The altitude is observed as near noon as possible; but good results may be obtained as much as thirty or forty minutes from noon. It is important that the hour angle should be computed accurately, or as nearly so as possible. This depends somewhat on the degree of certainty of the longitude and more particularly so when the hour angle is great. When the altitude is observed, note the time by chronometer and to it apply the error and rate, if any, and the result will be the Greenwich mean time, and with it correct the declination and equation of time as usual. Apply the equation of time to the Greenwich mean time to obtain the Greenwich apparent time, and to this apply the longitude to obtain the local apparent time. If that time is over twelve hours, subtract twelve hours from it and the remainder will be the hour angle. If the local time is less than twelve hours, subtract it from twelve hours to obtain the hour angle. The seconds of the hour angle must be reduced to at least one decimal place. The hour angle is then squared, which means that it is to be multiplied by itself. As an example: Suppose the hour angle to be 3m. Then $3 \times 3 = 9$, which would be the hour angle square. If the hour angle is less than thirteen minutes, its square may be obtained from table 27. If the new edition of Bowditch is used, table 27 will be found to contain the square of the hour angle to twenty-six minutes, multiplied by the numbers from table 26.

The hour angle having been found and squared, altitude and declination corrected, enter table 26 with the nearest degree of the latitude by account and the declination, having regard if they are of same or different name, and take out the corresponding number and multiply it by the hour angle square. The result will be the correction in seconds (″) to be always added to the true altitude. The zenith distance is then found and the latitude determined in the usual way.

Table 26 may be used for any body not exceeding twenty-four degrees declination, but the same table in the new edition can be used for declinations to 63°

Example: December 20, 1902. The observed altitude of the sun's lower limb was 47° 10′ 00″ S. Longitude by account 65° 00′ 00″ W. Time by chronometer 4h 17m 19s P. M., and fast 3m 07s. Height of eye 19 feet. Latitude by account 19° 12′ N.

Chro. time		4h	17m	19s P. M.
Fast	—		3	07
G. M. T.		4	14	12 P. M.
Equ. of time	+		2	33
G. A. T.		4	16	45
Long. 65° W. =	—	4	20	00
L. A. T.		11	56	45 A. M.
		12	00	00
Hour angle 3m.25 =			3	15

Equ. of time		2m	38s.26	
Cor.	—		5.26	
Cor. equ. of time		2	33.00	
Dec.		23°	25′	45″ 2 S
Cor.	+			11.3
Cor. dec.		23	25	56.5 S.

Obs. alt. L. L.		47°	10′	00″ S.
Semi-diam.	+		16	17
		47	26	17
Dip	—		4	16
		47	22	01
Ref.	—			54
		47	21	07
Par.	+			06
True alt.		47	21	13
Cor.	+			27
Mer. alt.		47	21	40
		90	00	00
Zen. dist.		42	38	20 N.
Cor. Dec.	—	23	25	56 S.
Lat.		19	12	24 N.

H. A.^{2} = 3m.25 × 3m.25

3m 25
× 3m.25
1625
650
975
H. A.^{2} = 10.5625
Table 26 × 2″.6
633750
211250
Cor. 27″ = 27.46250

H. D.	1s.239
G. M. T.	× 4h.25
	6195
	2478
	4956
Cor. 5s.26 =	5s.26575

H. D.	2″.67
G. M. T.	× 4h.25
	1335
	534
	1068
Cor. 11″.3 =	11.3475

See problems on pages 26 and 27, Pugsley's Guide to Local Inspectors Examinations.

Example: March 27, 1902. The observed altitude of the sun's lower limb was 50° 10′ 10″ S. Longitude by account 63° 30′ 00″ W. Time by chronometer 4h 56m 38s P. M., and slow 4m 28s. Height of eye 30 feet. Latitude by account 40° 56′ 00″ N.

Chro. time		4h	56m	38s P. M.
Slow	+		4	28
G. M. T.		5	01	06 P. M.
Equ. of time	—		5	38
G. A. T.		4	55	28
Long. 63° 30′ W. =	—	4	14	00
L. A. T.		12	41	28
		12	00	00
Hour angle 41m.5 =			41	28

Equ. of time		5m	41s.99	
Cor.	—		3.84	
Cor. equ. of time		5	38.15	
Dec.		2°	20′	26″.0 N.
Cor.	+		4	53.8
Cor. dec.		2	25	19.8 N.

H. D.	0s.769
G. M. T.	× 5h
Cor. 3s.84	3s.845

Obs. alt. L. L.		50°	10′	10″ S.
Semi-diam.	+		16	03
		50	26	13
Dip	—		5	22
		50	20	51
Ref.	—			49
		50	20	02
Par.	+			06
True alt.		50	20	08
Cor.	+	1	08	03
Mer. alt.		51	29	01
		90	00	00
Zen. dist.		38	30	59 N.
Cor. dec.	+	2	25	20 N.
Lat.		40	56	19 N.

H. A.^{2} = 41m.5 × 41m.5

41.5
× 41.5
2075
415
1660
H. A.^{2} = 1722.25
Table 26 2′ 4
688900
344450
Cor. 1° 09′ 53″ = 4133.400

H. D.	58″.77
G. M. T.	× 5h
Cor. 4′ 53″.8 =	293″.85

Explanation of Compass Terms.

Variation of the compass is the difference between the magnetic compass on the chart and the true compass in any particular locality.

Deviation of the compass is the difference between the magnetic compass on the chart and the ship's compass, and is caused by the iron and steel of which the ship may be wholly or partly constructed, and like substance in the cargo.

Local attraction is the effect of iron or steel or like substance outside the ship, such as pier sheds, mooring bits, dock machinery, etc.

Heeling error is the quantity a ship affects the compass by heeling. It may either increase or decrease the deviation.

Leeway is the angle between the compass course and the direction the ship makes through the water.

Compass error is the joint effect of variation and deviation.

Compass course is the course steered by the ship's compass.

Magnetic course is that taken from the magnetic compass on the chart.

True course is the course steered by compass corrected for every influence affecting it.

In the tropics, the sun's heat on the side of a black painted iron ship has been known to affect the compass to the extent of eight or nine degrees.

Deviation of the Compass by an Amplitude.

When the sun's center is on the horizon, observe its bearing and note the course and time by the ship's clock. Correct the clock time for the ship's run since last regulated, and apply the longitude to find the Greenwich time, and with it, correct the declination.

Add together the secant of the latitude and sine of the declination, and the sum will be the sine of the true amplitude reckoned from the east or west and takes the name of the declination. The difference between the two bearings will be the compass error. When the compass amplitude is to the left of the true amplitude, the error is east; to the right, it is west. To the compass error, apply the variation from the chart to find the deviation.

Example: March 7, 1902. Latitude by account 30° 12′ N. Longitude by account 68° 00′ W. The observed amplitude of the sun's center was E. 6° 00′ N. Local apparent time 6h 12m A. M. Variation 6° 00′ W.

L. A. T.		6h 12m A. M.		Dec.	5° 31′ 23″ S.		H. D.	58″.20
Long. 68°00′=	+	4 32		Cor.	+ 1 16		Time from noon	×1h.3
G. A. T.		10 44	A. M.	Cor. dec.	5 32 39 S.			17460
		12 00						5820
Time from noon		1 16					Cor. 1′ 16″=75″.660	

Lat.		30° 12′ N.	Sec.	.06335	
Dec.		5 32 S.	Sin.	8.98419	
True amp.	E. 6° 24′ S.		=Sin.	9.04754	
Com. "	E. 6 00 N.				
Com. error	12 24 E.				
Var. (chart).	6 00 W.				
Dev.	18 24 E.				

Example: July 14, 1902. Latitude by account 33° 15′ N. Longitude by account 67° 30′ W. The observed amplitude of the sun's center was W. 36° 00′ N. Local mean time 7h 07m P. M. Variation 7° 00′ W.

L. M. T.		7h 07m P. M.		Dec.	21° 47′ 43″ N.		H. D.	22″.05
Long. 67° 30′ W.=	+ 4 30			Cor.	— 4 16		G. M. T.	11h.6
G. M. T.		11 37	P. M.	Cor. d c.	21 43 27 N.			13230
								2205
								2205
							Cor. 4′ 16″=255″.780	

Lat.		33° 15′ N.	Sec.	.07765	
Dec.		21 43 N.	Sin.	9.56822	
True amp.	W. 26 16 N.		=Sin.	9.64587	
Com. "	W. 36 00 N.				
Com. error	9 44 W.				
Var. (chart)	7 00 W.				
Dev.	2 44 W.				

Compass Error and Deviation by Azimuth.

Observe the bearing by compass and the altitude, and correct the altitude and find the polar distance same as in finding longitude by chronometer. Instead of noting the time by chronometer, the Greenwich time can be found by adding the longitude in time, if west, to the ship's time. If longitude is east, subtract longitude in time from the ship's time.

Add together the polar distance, latitude and altitude, and divide the sum by 2 and find the difference between the half sum and polar distance.

From table 44 take the log. secant of the latitude; log. secant of the altitude; log. cosine of the half sum and log. cosine of the difference. Half their sum will be the cosine of half the true azimuth, which when multiplied by 2 will give the true azimuth, and name it same as the latitude and reckon it towards the east if ship's time is A. M., and towards the west if ship's time is P. M.

The difference between the compass and true azimuths will be the compass error, and if the true azimuth falls to the left of the compass azimuth, the error is west; if to the right, it is east.

To the compass error, apply the variation from the chart, to find the deviation.

Example: Sept. 18, 1902, A. M. The observed altitude of the sun's lower limb was 18° 24′30″. G. M. T. 1h 11m 17s P. M. Latitude by account 19° 56′ N. The sun's bearing by compass was N. 78° E. Variation by chart 6° E. Height of eye 35 feet.

Obs. alt. L. L.	18° 24′ 30″		Dec.	2° 08′ 11″ N.		H. D.	58″.1	
Semi-diam.	+ 15 56		Cor.	1 10		G. M.T.	× 1.2	
	18 40 26		Cor. dec.	2 07 01			1162	
Dip	— 5 48			90 00 00			581	
	18 34 38		P. D.	87 52 59			1′ 10″ = 69.72	
Ref.	— 2 52							
	18 31 46							
Par.	— 08							
True alt.	18 31 54							
P. D.	87° 52′ 59″							
Lat.	19 56 00	Sec.	.02683		½ true az.	47° 18′		
Alt.	18 31 54	Sec.	.02313			× 2		
	2)126 20 53				True az.	N. 94 36 E.		
½ sum	63 10 26	Cos.	9.65456		Com. az.	N. 78 00 E.		
P. D.	87 52 59				Com. error	16 36 E.		
Diff.	24 42 33	Cos.	9.95827		Var. (chart)	6 00 E.		
			2)19.66279		Dev.	10 36 E.		
½ true az.	47° 18′	= Cos.	9.83139					

Example: Aug. 9, 1902. The observed altitude of the sun's lower limb was 43° 55′ 00″. Longitude by account 83° 25′ W. Latitude by account 23° 51′ N. Local apparent time 8h 47m A. M. The sun's bearing by compass was N. 95° E. Variation by chart 5° E. Height of eye 25 feet.

Obs. alt. L. L.	43° 55′ 00″	L. A. T.	8h 47m 00s	A. M.				
Semi-diam.	+ 15 48	Long. 83° 25′ W. =	+ 5 33 40					
	44 10 48	G. A. T.	2 20 40	P. M.				
Dip	— 4 54							
	44 05 54	Dec.	16° 03′ 47″ N.			H. D.	42″.81	
Ref.	— 1 00	Cor.	— 1 38			G. A. T.	× 2h 3	
	44 04 54	Cor. dec.	16 02 09				12843	
Par.	+ 07		90 00 00				8562	
True alt.	44 05 01	P. D.	73 57 51				1′ 38″ = 98.463	
P. D.	73° 57′ 51″							
Lat.	23 51 00	Sec.	.03877		½ true az.	45° 13′		
Alt.	44 05 01	Sec.	.14368			× 2		
	2)141 53 52				True az.	N. 90 26 E.		
½ sum	70 56 56	Cos.	9.51374		Com. az.	N. 95 00 E.		
P. D.	73 57 51				Com. error.	4 34 W.		
Diff.	3 00 55	Cos.	9.99940		Var. (chart)	5 00 E.		
			2)19.69559		Dev.	9 34 W.		
½ true az.	45° 13′	= Cos.	9.84779					

Example: Feb. 27, 1902. The observed altitude of the sun's lower limb was 51° 15′ 10″. Longitude by account 101° 58′ W. Latitude by account 33° 52′ S. Local apparent time 2h 15m P. M. The sun's bearing by compass was S. 129° W. Variation by chart 7° W. Height of eye 49 feet.

Obs. alt. L. L.	51° 15′ 10″	L. A. T.	2h 15m 00s P. M.		
Semi-diam.	+ 16 10	Long. 101° 58′ W. =	+ 6 47 52		
	51 31 20	G. A. T.	9 02 52 P. M.		
Dip	— 6 56				
	51 24 24	Dec.	8° 34′ 43″ S.	H. D.	56″.19
Ref.	— 47	Cor.	— 8 26	G. A. T.	× 9
	51 23 37	Cor. dec.	8 26 17	8′ 26″ =	505.71
Par.	+ 06		90 00 00		
True alt.	51 23 43	P. D.	81 33 43		

P. D.	81° 33′ 43″			½ true az.	61° 57′
Lat.	33 52 00	Sec.	.08075		× 2
Alt.	51 23 43	Sec.	.20490	True az.	S. 123 54 W.
	2)166 49 26			Com. az.	S. 129 00 W.
½ sum	83 24 43	Cos.	9.05937	Com. error.	5 06 W.
P. D.	81 33 43			Var. (chart)	7 00 W.
Diff.	1 51 00	Cos.	9.99977	Dev.	1° 54′ E.
			2)19.34479		
½ true az.	61° 57′	= Cos.	9.67239		

Use of the Azimuth Tables.

Instead of computing the true bearing or azimuth of a heavenly body, it may be taken from the azimuth tables by inspection, and when the conditions are such that the true bearing is frequently necessary, considerable labor and time is saved by their use.

They are convenient for finding the most favorable time to obtain an observation for longitude—that is, when the body bears nearest true east or west, also for plotting Summer lines. The initial and final courses of a great circle track may be obtained by these tables

When using the tables for the moon, stars or planets, in place of the local apparent time, find the hour angle of the body and with it enter the P. M. column. When making an amplitude, convert the compass bearing into an azimuth.

To find the sun's true bearing, enter the table with the local apparent time and declination under the proper latitude, having regard if the latitude and declination are of same or different name, and the true azimuth will be found at the intersection of the time and declination.

To find the most favorable time for an observation of the sun for longitude, enter the table under the proper latitude and declination and abreast of the bearing nearest 90° will be found the time—A. M. or P. M., as the case may be. For the moon, star or planet, the hour angle will be found in the P. M. column.

For plotting Summer lines, it is only necessary to draw a line through one longitude at right angles to the true bearing of the body observed.

The azimuth tables are used in finding the initial and final courses of a great circle track by taking the latitude left as the latitude, the latitude of the point bound to as the declination and the difference of longitude as the hour angle. The corresponding angle will be the initial course. The operation may be repeated from different points of the track until the other courses are found. The final is found by using the latitude bound to as the latitude left, and the latitude left as that of the destination.

Jersey City, September 24, 1890.

Mr. H. Louderbough.

Dear Sir.—I painted schooner "Enchantress" last January on Perth Amboy Dry Dock with one coat of New Jersey Copper Paint, and after running all summer to Port Royal and Charleston, S. C., I lifted to-day at Bulman & Brown's Dry Dock, and found my vessel in splendid condition, her seams being full of barnacles, but her painted bottom was as smooth as when painted. FRANK ROLLENT.

Edgartown, Mass., January 19, 1891.

H. Louderbough.

Dear Sir.—I used the New Jersey Copper Paint sent me, and it proved to be as represented, "the best in the market." I have used several different kinds, but never found any that would run over three months; but this ran six months, and was as clean from grass and barnacles as when it was applied.

I remain, yours, &c.,

JAMES C. SANDSBURY.

Latitude by Meridian Altitude of Fixed Star.

Observe the meridian altitude of the star and correct it for instrumental error, dip and refraction, and subtract it from 90° and the result will be the zenith distance, which is named contrary to the star's bearing. If the zenith distance and declination are of same name, add them together; but if of different name, take their difference, and the result will be the latitude which takes the name of the greater.

Before observing the meridian altitude of a star, it is customary to compute the time it will pass the meridian and the altitude at that instant.

To find the time a star will pass the meridian, subtract the sun's right ascension from the star's right ascension, and the result will be the local apparent time of the star's meridian passage. If the local mean time of the star's meridian passage is required, use the sidereal time instead of the sun's right ascension. If the star's right ascension is less than that of the sun, it must be increased by twenty-four hours.

To compute the altitude, subtract the latitude by account from 90°, and the remainder will be the co-latitude. If the latitude and star's declination are of same name, add them together, but if of different name, take their difference and the result will be the star's true meridian altitude. To this add the dip and refraction to obtain the altitude that will be observed if the latitude by account is correct. If the instrument is set to correspond with the computed altitude, the observer will find the proper star without difficulty.

Example: January 16, 1902. Latitude by account 37° 19′ N. The latitude by meridian altitude of the star Castor is required. Height of eye 36 feet.

Star's R. A.		7h	28m	21s
Add		24	00	00
		31	28	21
Sun's R. A		19	49	43
L. A. T. Star's Mer. Pass.		11	38	38 P.M.

Lat. by account		37°	19′	00″	N.
		90	00	00	
Co-lat.		52	41	00	
Star's dec.	+	32	06	14	N.
True alt		84	47	14	S.
Dip	+		5	48	
		84	53	02	
Ref	+			05	
Obs. alt.		84	53	07	S.

Obs. alt.		84°	53′	07″	S.
Dip	—		5	48	
		84	47	19	
Ref.	—			05	
		84	47	14	
True alt		90	00	00	
Zen. dist.		5	12	46	N.
Star's dec.	+	32	06	14	N.
Lat.		37	19	00	N.

By this observation the latitude by account is found to be correct.

Example: March 17, 1902. Observed altitude of the star Rigel was 53° 40′ 30″ S. I.C.+2′ 10″. Height of eye 40 feet.

Obs. alt.		53°	40′	30″	S.
I. C.	+		2	10	
		53	42	40	
Dip	—		6	12	
		53	36	28	
Ref.	—			42	
		53	35	46	
		90	00	00	
Zen. dist.		36	24	14	N.
Star's dec.	—	8	18	53	S.
Lat.		28	05	21	N.

"New Jersey" Marine Mixed Paints

being quick drying they are very desirable for vessels, also by their combination they hold the oil much longer than other paints and you do not have the annoyance of having a slow drying paint on your vessel.

Example: Sept. 24, 1902. Latitude by account 16° 15′ S. The latitude by the star Aldebaran is required. Height of eye 30 feet.

Star's R. A.	4h	30m	18s	
Add	24	00	00	
	28	30	18	
Sid. time.	12	05	36	
Ast. time, Sept. 23	16	24	42	
	−12	00	00	
L. M. T. Star's Mer. Pass.	4	24	42	A.M.

Obs. alt	57°	36′	30″	N.
Dip.	—	5	22	
	57	31	08	
Ref.	—		36	
True alt.	57	30	32	
	90	00	00	
Zen. dist.	32	29	28	S.
Star's dec.	−16	18	45	N.
Lat.	16	10	43	S.

Lat. by account.	16°	15′	00″	S.
	90	00	00	
Co-lat.	73	45	00	
Star's dec.	−16	18	45	N.
True alt.	57	26	15	N.
Dip	+	5	22	
	57	31	37	
Ref.	+		36	
Obs. alt.	57	32	13	

By this observation the latitude by account is found to be about 4′.1 in error.

Astronomical Time.

That everyone attempting to learn nautical astronomy experiences more or less difficulty in understanding astronomical time is a fact conceded by navigators generally.

An effort is made here to explain it as simply as possible that it may be thoroughly comprehended by all interested.

The civil day is reckoned from one midnight to the next. The first half is called A. M., and the second half P. M. It is the date used in ordinary business transactions.

The astronomical day is reckoned from one noon to the next, and the hours are counted consecutively from 0h to 24h. It is the time used generally in astronomical calculations. When the civil date is A. M., the astronomical date is one day behind it, and when the civil date is P. M., the dates correspond.

By a little study it may be noticed that astronomical time is the hours past the last noon, and the civil date of that noon will be the astronomical date.

Suppose it is desired to turn the civil date, June 4th, 6h 10m A. M. into astronomical time. It is clear that 6h 10m A. M. is 18h 10m past the last noon. It is also clear that the last noon occurred on June 3d. Therefore the astronomical date and time is June 3d, 18h 10m. Suppose the civil time is August 8th, 7h 12m P. M. The time is 7h 12m past the last noon, and the last noon occurred on August 8th. It follows then, that the astronomical date and time is August 8th, 7h 12m, which corresponds with the civil time and date.

TESTIMONIALS.

"NEW JERSEY" ANTI-CORROSIVE PAINT—No. 1. ANTI-FOULING PAINT—No. 2.

Jersey City, N. J., Nov. 12, 1901.

Harry Louderbough.

Dear Sir.—Your "New Jersey" Copper Paint and your Anti-Corrosive and Anti-Fouling Paints have for many years been used very freely at our Dry Docks, and we can cheerfully give them the hearty endorsement they deserve, for they have both satisfied our patrons as well as ourselves.

Yours truly,

THE BROWN DRY DOCK COMPANY.

Jersey City, N. J., Nov. 1, 1901.

Mr. H. Louderbough.

Dear Sir.—Our acquaintance with marine paints has run over a number of years, and it is with great pleasure we endorse your "New Jersey" Copper Paint, Anti-Corrosive and Anti-Fouling Paints. Also, your production of Iron Crown Paint for Iron Vessels and your Wetterstedt Copper Paint.

Yours truly, BURT & MITCHELL CO.

Brooklyn, N. Y., Nov. 10, 1901.

Mr. Harry Louderbough.

Dear Sir.—I have used at our Dry Docks your Bottom Paint for Iron Vessels, and found your "New Jersey" Anti-Corrosive and Anti-Fouling Paints very effective Paints. Both can be applied quickly, saving all annoyance of delays. Their use has been gratifying to my customers and myself.

Very truly yours,

WM. GOKEY.

Hampton, Va., May 3, 1890.

Mr. H. Louderbough.

Dear Sir.—After having used your New Jersey Copper Paint at our Railways in Hampton, we take great pleasure in recommending the same to all users of Copper Paint. The good qualities of New Jersey Copper Paint make it very popular with us and our trade.

Yours truly,

WARREN HALL & CO.,

Props. Marine Railway at Hampton, Va.

Time.

The time in general use, and shown by clocks, chronometers, etc., is mean time, and therefore does not correspond with the motion of the sun.

Because of the form of the earth's orbit, the apparent solar day, which is the interval between two successive passages of the sun over the same meridian, is not of uniform length, and varies daily. It then follows that no piece of mechanism could be constructed to keep such time. However, the difficulty has been overcome by taking the average length of the apparent solar day, and giving it a mean value of twenty-four uniform hours. At certain seasons of the year, this time corresponds exactly with the apparent time, while at others, the mean solar day is as much as sixteen minutes shorter, and finally becomes about fourteen minutes longer. This difference is called the equation of time and is found in the nautical almanac for every day in the year, and also, how to apply it.

Navigators always obtain apparent time from their observations, and readily turn it into mean time by applying the equation of time. By the opposite operation, they turn mean time into apparent time.

For the sake of convenience a system of keeping mean time has been adopted. The meridians taken for this purpose are 15° or one hour apart. All clocks on such meridians and within 7° 30′ of them, are regulated to the same local mean time. By this system of time, a person receiving a letter or telegram may determine the length of time it required to reach him.

Suppose a person in Jersey City receives a telegram at 9h P. M., from San Francisco, and showed that it had been started at 1h P. M. The clocks in San Francisco are regulated to Pacific time, which is 3h slower than Eastern time to which the clocks in Jersey City are regulated. Then the telegram must have been started at 10h A. M. (Eastern time), which shows that it required eleven hours to reach Jersey City.

The following shows the various times, and their meridians, using New York as a reference:

GREENWICH.

Longitude 0°, and five hours faster than New York time, and is that time to which navigators' chronometers are regulated.

INTERCOLONIAL.

Longitude 60° W., and one hour faster than New York time.

EASTERN.

Longitude 75° W., and that time to which clocks in New York are regulated.

CENTRAL.

Longitude 90° W., and one hour slower than New York time.

MOUNTAIN.

Longitude 105° W., and two hours slower than New York time.

PACIFIC.

Longitude 120° W., and three hours slower than New York time.

SITKA.

Longitude 135° W., and four hours slower than New York time.

TAHITI.

Longitude 150° W., and five hours slower than New York time.

PACIFIC CENTRAL.

Longitude 165° W., and six hours slower than New York time.

ANTIPODES.

Longitude 180° and seven hours slower than New York time.

"New Jersey"

ANTI-CORROSIVE PAINT No. 1.
PRIMING COAT.

ANTI-FOULING PAINT No. 2.
FINISHING COAT.

BEST QUALITY. HIGHEST TESTIMONIALS.

Latitude by Meridian Altitude of the Moon.

From the nautical almanac (page 4 of the month) take the time of the moon's meridian passage at Greenwich for the civil date if the time is P. M. If the time is A. M., take it out for the preceding date. Multiply the hourly difference by the longitude in time, and in west longitude add the product, and in east longitude subtract it from the time of the meridian passage at Greenwich, and the result will be the local mean time of the meridian passage in the longitude used. The Greenwich mean time of the passage in that longitude is found by adding the longitude in time, if west, and subtracting it if east, from the local mean time of the moon's meridian passage.

The altitude is to be observed in the usual manner, and corrected for semi-diameter and dip. The semi-diameter is found on page 4 (of the month) and must be taken out for either noon or midnight, according to which the Greenwich time is nearest. The horizontal parallax is taken from the same page in the same manner.

Take out the declination for the Greenwich day and hour, and correct it for the odd minutes.

The altitude having been corrected for semi-diameter and dip, enter table 24 with it, and the horizontal parallax, and take out the corresponding correction, which is the parallax in altitude, and is always additive to the altitude, and the result will be the true altitude.

Having found the true meridian altitude and corrected the declination to the Greenwich instant of observation, proceed the same as finding latitude by meridian altitude of the sun.

Note.—The semi-diameter, horizontal parallax and declination must be for the same date as the meridian passage.

There are small corrections for the semi-diameter and parallax; but as their value is very small and of little or no importance to this observation, they are not treated here.

Example: August 15, 1902, P. M. The observed meridian altitude of the moon's lower limb was 43° 54′ S. Longitude by account 75° W. Height of eye 26 feet.

Mer. Pass at G.		9h. 23m.7	
Cor.	+	9 .9	
L. M. T. Mer. Pass.		9 33 .6	
Long 75°W.=	+	5 00 .0	
G. M. T. Mer. Pass.		14 33 .6	

H. D. 1m. 99
Long 75°= × 5h
Cor. 9m. 9=9.95

Obs. alt. L. L.		43° 54′ 00″	S.
Dip	—	5 00	
		43 49 00	
Semi-diam.(mdt)	+	14 54	
		44 03 54	
Par.	+	38 35	
True alt.		44 42 29	
		90 00 00	
Zen. dist.		45 17 31	N.
Cor. dec.		−17 32 55	S.
Lat.		27 44 36	N.

Dec. 14h. 17° 35′ 09″ S.
Cor.33m.6= 2 14
Cor. dec. 17 32 55

M. D. 3″.996
× 33m.6
23976
11988
11988
Cor.2′14″=134.2656

Hor. par. (mdt.) 55′=Par. alt. 38′35′

Example: November 21, 1902, A. M. The observed altitude of the moon's lower limb was 43° 15′ 30″ N. Longitude by account 75° E. Height of eye 40 feet.

Mer. Pass. at G.		17h. 01m.5	
Cor.	—	11 .1	
L. M. T. Mer. Pass.		16 50 .4	
Long. 75° E.	—	5 00 .0	
G. M. T. Mer. Pass.		11 50 .4	

H. D. 2m. 23
Long. 75° = × 5h
Cor. 11m.1= 11.15

Obs. alt. L. L.		43° 15′ 30″	N.
Dip	—	6 12	
		43 09 18	
Semi-diam. (mdt).	+	16 09	
		43 25 27	
Par.	+	41 48	
True alt.		44 07 15	
		90 00 00	
Zen. dist.		45 52 45	S.
Cor. dec.		−12 45 45	N.
Lat.		33 07 00	S.

Dec. 12h. 12° 44′ 23″ N.
Cor.9m.6+ 1 22
Cor dec. 12 45 45 N.

M. D. 8″.532
× 9m.6
51192
76788
Cor. 1′ 22″ = 81.9072

Hor. par.(mdt.) 59′=Par.alt. 41′ 48′

To Find Longitude by a Star.

Observe an altitude when the star is on or as near the prime vertical as possible and note the time by chronometer. Correct the altitude for index error, dip and refraction, and apply the rate of the chronometer to the time noted. Take the star's declination from the nautical almanac, and correct it if necessary, and subtract it from 90° if same name as latitude. If of different name, add it to 90°, and the result will be the polar distance. On the same page where the declination was found, will be the star's right ascension. Correct sidereal time for the Greenwich time by table 9, and the result will be the corrected sidereal time or right ascension of the mean sun. From half the sum of the true altitude, latitude and polar distance, subtract the true altitude, and the result will be the remainder. Then add together the log. secant of the latitude, log. cosecant of the polar distance, log. cosine of the half sum and log. sine of the remainder, and divide their sum by two, and the result will be the log. sine of the star's hour angle, which is always taken from the P. M. column. If the star is west of the meridian, add its right ascension to the hour angle; but if the star is east of the meridian, subtract the star's hour angle from the star's right ascension, and if the right ascension is too small, add twenty-four hours to it, and the result will be the right ascension of meridian. From the right ascension of meridian, subtract the corrected sidereal time or right ascension of mean sun; but if the right ascension of meridian is too small, add twenty-four hours to it, and the result will be the local mean time at ship. The difference between the local mean time and Greenwich mean time will be the longitude in time, and this is turned into degrees, etc.

Example: January 1, 1902, P. M. Latitude by account 51° 30′ N. Observed altitude of the star *a* Arietis east of the meridian was 52° 20′. Time by chronometer 9h 17m 06s P. M., and slow 9m 7s. Height of eye 35 feet. I. C. 10′ +.

Obs. alt.		52°	20′	00″	Chro.		9h	17m	06s	Dec.	22° 59′ 57″ N.
I. C.	+		10	00	Slow	+		9	07		90 00 00
		52	30	00	G. M. T.		9	26	13	P. D.	67 00 03
Dip	−		5	48							
		52	24	12	Sid. time		18h	40m	49s		
Ref.	−			45	Cor.	+		1	33		
True alt.		52	23	27	Cor. sid. time		18	42	22		

Alt.		52°	23′	27″		
Lat.		51	30	00	Sec.	.20585
P. D.		67	00	03	Cosec.	.03597
		2)170	53	30		
½ sum		85	26	45	Cos.	8.89983
Alt.		52	23	27		
Rem.		33	03	18	Sin.	9.73675
						2)18.87840
		2h	07m	36s	Sin.	9.43920
Tab. cor.	+			3		
Star's H. A.		2	07	39 E.		
Star's R. A.		2	01	39		
R. A. M.		23	54	00		
Sid. time		18	42	22		
L. M. T.		5	11	38 P. M.		
G. M. T.		9	26	13 P. M.		
Long.		4	14	35 W.		

4h = 60°
14m = 3 30′
35s = 8 45″
Long. 63 38 45 W.

New York, March 24, 1891.

Mr. H. Louderbough.

At my two dry docks at the foot of Stanton St., E. R., I have applied a considerable quantity of your New Jersey Copper Paint, and I must say that my customers and myself have been greatly pleased with it, and in my judgment I believe New Jersey "leads them all."

JAMES SHEWAN.

Port Richmond, March 24, 1891.

Mr. H. Louderbough.

Dear Sir.—After a test of two seasons of your New Jersey Copper Paint with others, we are free to confess in our judgment New Jersey "leads them all." Our customers also give your Paint this strong endorsement.

I remain, yours, &c.,
McWILLIAMS, BURLEE & CO.
Owners Marine Slip.

St. Louis, Mo., Dec. 11, 1904.

Harry Louderbough.

Dear Sir.—Last year I purchased your "New Jersey" Yacht Red Copper Paint for my yacht. I put the paint on under adverse conditions, the weather was cold and frosty and my boat not thoroughly dry, just before launching I put on another coat. I took my boat out to-day and was surprised to find how excellently the paint had worn, it is simply "all right." Very respectfully,

MAX C. STARKLOFF, M. D.

Greenpoint, L. I., February 19, 1891.

Mr. H. Louderbough.

Dear Sir.—Having applied the New Jersey Yacht Copper for yachts, I do not hesitate to say it is a very superior Paint for yachts' bottoms, being very smooth. It is so finely ground that it makes a good sailing bottom. I remain, yours, etc.,

FRED. C. BEEBE

Example: January 2, 1902, A. M. Latitude by account 33° 20′ N. The observed altitude of the star α Canis Minoris (Procyon) was 21° 41′ 00″ west of the meridian. Time by chronometer 7h 56m 03s A. M., and slow 8m 14s. Height of eye 45 feet. I. C. 30′ +.

Obs alt.		21°	41′	00″	Chro.		7h	56m	03s	Dec.	5° 28′ 34″ N
I. C.	+		30	00	Slow	+		8	14		90 00 00
		22	11	00	G. M. T		8	04	17	P. D.	84 31 26
Dip	−		6	36							
		22	04	24	Sid. time		18h	40m	49s		
Ref.	−		2	23	Cor.	+		3	18		
True alt.		22	02	01	Cor. sid. time		18	44	07		

Alt.		22°	02′	01″			
Lat.		33	20	00	Sec.		.07806
P. D.		84	31	26	Cosec.		.00199
		2)139	53	27			
½ sum		69	56	43	Cosine		9.53520
Alt.		22	02	01			
Rem.		47	54	42	Sin.		9.87047
							2)19.48572
		4h	28m	40s	= Sin.		9.74286
Tab. cor.	+			01			
Star's H. A.		4	28	41	W.		
" R. A.		7	34	10			
R. A. M.		12	02	51			
Sid. time.		18	44	07			
L. M. T.		17	18	44	Ast.		
		12	00	00			
L. M. T.		5	18	44	A. M.		
G. M. T.		8	04	17	A. M.		
Long.		2	45	33	W.		

2h	=	30°	
45m	=	11	15′
33s	=	8	15″
Long.		41	23 15 W.

TESTIMONIALS FOR

"New Jersey" Yacht Red and Green Copper Paint.

New York, Jan. 16, 1905.

H. Louderbough, Esq.,

Dear Sir.—Having sailed yachts of my own and also those of many other people for the past thirty years I would say that in all my experience I have never had so much satisfaction as when I had "New Jersey" Red Copper Paint on the bottom of my yacht, it is a sure anti-fouler, besides being very smooth, making a fine sailing bottom. Last spring I painted the catboat "Caco" with your "New Jersey" Yacht Red Copper Paint and when I took her out of the water in November, she was as smooth as I could want, not a barnacle on her.

Yours truly,
CAPT. G. E. CORDEAUX.

City Island, N. Y., February 16, 1891.

Mr. H. Louderbough.

Dear Sir.— I have used the New Jersey Red Copper which you prepare specially for yachts at my Railway the past season, and can cheerfully testify to its merits, it being so thoroughly ground, and its smooth surface has made it a very popular Paint with yachtsmen. I remain, yours, &c.,

A. ROBINSON.

Fall River, Mass., Nov. 9, 1901.

Mr. H. Louderbough.

Dear Sir.—In our construction plant and Marine Railways, we have been extensive users of your Yacht Paint Specialties, and in their use results have both pleased our customers and ourselves, and we can cheerfully give them our endorsement.

Yours truly, READ BROTHERS.

Gloucester, Mass., Oct. 1, 1901.

Mr. H. Louderbough.

Dear Sir.—I have sold and applied for several years, your "New Jersey" and Yacht Red Copper Paints as a painter. I have come in contact with many paints, but none that has given me the satisfaction your Paint has done. Its consistency is about right, being neither too thick nor too thin, it enters the pores of the wood freely and at the same time gives a good coating on the outside as a protection against fouling. I am, yours truly,

D. A. MITCHELL.

Tottenville, N. Y., Nov. 5, 1901.

Mr. H. Louderbough.

Dear Sir.—In the use of Copper Paints, one comes in contact with many brands; and in regards to your productions of New Jersey Copper Paint and Yacht Red and Yacht Green Copper Paints, I have always found them great favorites, as their pronounced qualities make them the most popular and the best Anti-Fouling Paints manufactured.

Yours truly, W. H. SMITH.

Brooklyn, N. Y., February 10, 1891.

Mr. H. Louderbough.

Dear Sir.—At our boat house we have used your New Jersey Red Copper Paint, specially ground for yachts, on our new boats, and find it to be a superior Paint, in fact the best we have ever used, and we can recommend it to any owners of yachts.

We remain, respectfully,

WALLIN & GORMAN.

Sumner's Method.

While this method of determining the longitude, latitude and true azimuth at sea is used by navigators generally, few are familiar with its history, and for that reason a brief account of it is given here.

Capt. Thomas H. Sumner was an American by birth, and at the time he discovered this important method of determining a ship's position at sea, which has proved so valuable to navigators, he commanded an American ship.

On November 25, 1837, he sailed from Charleston, S. C., for Greenock, and when off the Irish coast and the latitude being uncertain, he obtained the observations which have made his name immortal among the navigators of every nation, for he has given them one more method of finding their position and the true azimuth of any heavenly body.

EXPLANATION.

Observe an altitude of the sun and to it apply the usual corrections, noting the time by chronometer. Supposing the latitude by account to be uncertain, assume two latitudes, say 5 to 30 miles or more, each side of that by account. Find the longitude in the usual way, using both of the assumed latitudes, and the result will be two longitudes. Place them on the chart and join them by a line which is called the first line of position. It is safe to say that the ship is somewhere on that line. When the sun's azimuth has changed about 20° or 30°, observe another altitude, correcting it and noting the time by chronometer. Use the assumed latitudes as before and obtain two longitudes, which are to be placed on the chart and joined by a line as in the first observation. Where the two lines cross, will be the ship's position, giving the latitude and longitude. If the ship has sailed in the meantime, move the first line of position a distance, east or west as the case may require, corresponding to the departure made. The true azimuth at the time of each observation will be represented by a line at right angle to the line of position.

This method is used with observations of any heavenly body in the same manner as with the sun. In fact, altitudes of two different stars may be observed at the same time, and the two lines of position be found at once.

Example: June 11, 1902, A. M. The observed altitude of the sun's lower limb was 22° 36′ 20″. Time by chronometer 10h 51m 54s A. M. Some time after that observation the observed altitude of the sun's lower limb was 64° 56′ 40″. Time bychronometer 2h 21m 53s P. M. The chronometer was fast 2m 40s. Index correction + 3′ 20″. Height of eye 20 feet. Latitude by account 35° 00′ N. Assume latitudes 15′ each side of that by account and find the latitude, longitude and sun's true azimuth by projecting the Sumner lines on the chart.

Mobile, Ala., Nov. 15, 1901.

H. Louderbough.

Dear Sir.—At our Marine Railways we have, for several years, used very freely large quantities of your "New Jersey" Copper Paint and it is very pleasing to note the general satisfaction with which our customers receive it. In our Southern waters, vessels foul quickly and we consider your production one of the best preventives that we have ever used.

Yours respectfully,
ROBT. MIDDLETON, Manager.

New York, June 10, 1895.

Mr. Harry Louderbough.

Dear Sir.—I have just painted at Tietjen & Lang's Dry Dock, at Hoboken, N. J., the Pilot Boat "James Gordon Bennett," and it affords me great pleasure to give your New Jersey Copper Paint my endorsement. Some years ago I was induced to give your Yacht Red Copper a trial, and it has always proven itself to be the best production for the bottom of a vessel that I have ever used, and it is now generally used by our Pilot Boats in New York Harbor.

JAMES F. BROWN,
Master Pilot Boat "James Gordon Bennett."

Hoboken, N. J., Oct. 15, 1901.

Mr. Harry Louderbough.

Dear Sir.—Our acquaintance with your brands of "New Jersey" Copper Paints, for wooden vessels, and your Anti-Corrosive and Anti-Fouling Paints for iron vessels, has run over a period of many years, and the results have been more than satisfactory to us and our patrons. Their vessels have not only been protected from barnacles and grass, but the surface, owing to the care exercised in manufacturing the Paints, has been very smooth, making a good sailing bottom.

Yours truly,
WILLADSEN DRY DOCK CO.

The Most Used
Because the Best
"New Jersey" Marine Paints

"New Jersey"

Anti-Corrosive Paint

NO. 1
PRIMING OR FIRST COAT

NO. 2
FINISHING COAT.

Anti-Fouling Composition

FOR IRON OR STEEL VESSELS.

AFTER a trial of several years these Paints have made for themselves many friends. Our TESTIMONIALS prove their merit. The first coat dries rapidly, and owing to this fact the first and second coats can be applied in a few hours, so after the bottom of a vessel is cleaned and prepared for painting it can be quickly finished.

New Jersey Paint Works,

HARRY LOUDERBOUGH
PROPRIETOR

JERSEY CITY, N. J., U. S. A.

FIRST ALTITUDE.

Obs. alt L. L.		22°	36′	20″	Dec.	23°	02′	33″ N.	H. D.	11″.18
I. C.	+		3	20	Cor.	—		13		× 1h.2
		22	39	40	Cor. dec.	23	02	20		2236
Semi-diam.	+		15	46		90	00	00		1118
		22	55	26	Pal dist.	66	57	40	Cor. 13″	—13″.416
Dip	—		4	23						
		22	51	03						
Ref.	—		2	17						
		22	48	46	Equa. of time	0m	46s.35		H. D.	0s 498
Par.	+			08	Cor.	+		.60		× 1h.2
True alt.		22	48	54	Cor. equa. of time	0		46.95		996
										498
									Cor. 0s.60	—.5976

Chro. time		10h	51m	54s A. M.
Fast.	—		2	40
G. M. T.		10	49	14

A

Alt.		22°	48′	54″					
Lat.		35	15	00	Log. secant	.08797			
P. D.		65	57	40	" cosecant	.03609			
		2)125	01	34					
½ sum		62	30	47	" cosine	9.66422			
Alt.		—22	48	54					
Rem.		39	41	53	" sine	9.80533			
						2)19.59361			
		6h	49m	52s	— sine	9.79680			
Tab. cor.	—			06					
L. A. T.		6	49	46		4h	=60°		
Equa. of time	—			47		00m	= 0	00′	
L. M. T.		6	48	59	A. M.	15s	=	3	45″
G. M. T.		10	49	14	A. M.	Long.	60	03	45 W
Long.		4	00	15					

B

Alt.		22°	48′	54″					
Lat.		34	45	00	Log. secant	.08531			
P. D.		66	57	40	" cosecant	.03609			
		2)124	31	34					
½ sum		62	15	47	" cosine	9.66784			
Alt.		—22	48	54					
Rem.		39	26	53	" sine	9.80304			
						2)19.59228			
		6h	50m	16s	— sine	9.79614			
Tab. cor.	+			03					
L. A. T.		6	50	19					
Equa. of time	—			47		3h	=45°		
L. M. T.		6	49	32		59m	=14	45′	
G. M. T		10	49	14		42s	=	10	30″
Long		3	59	42		Long.	59	55	30 W.

R. F. SEAMAN & CO.'S PRODUCTIONS.

Wetterstedt's Copper Paint. Seam Paint.
"Iron Crown" Anti-Corrosive Paint—No. 1.
"Iron Crown" Anti-Fouling Paint—No. 2.

Having purchased their trade-marks they are now manufactured by

HARRY LOUDERBOUGH, Proprietor,

NEW JERSEY PAINT WORKS,

JERSEY CITY, N. J.

SECOND ALTITUDE.

Obs. alt. L. L.		64°	56′	40″	Dec.		23°	02′	33″ N.	H. D. 11″.18
I. C.	+		3	20	Cor.	+			26	G. M. T. × 2h.3
		65	00	00	Cor. dec.		23	02	59	3354
Semi-diam.	+		15	46			90	00	00	2236
		65	15	46	Pol. dist.		66	57	01	Cor. 26″ = 25.714
Dip	—		4	23						
		65	11	23						
Ref.	—			27						
		65	10	56						
Par.	+			04	Equa. of time			0m	46s.35	H. D. 0s.498
True Alt.		65	11	00	Cor.	—			1 .15	G. M. T. 2h.3
					Cor. equa. of time			0	45 .20	1494
Chro. time		2h	21m	53s P. M.						996
Fast	—		2	40						Cor. 1s.15 — 1s.1454
G. M. T.		2	19	13						

C

Alt.		65°	11′	00″			
Lat.		35	15	00	Log. secant	.08797	
P. D.		66	57	01	" cosecant	03613	
		2)167	23	01			
½ sum		83	41	30	" cosine	9.04093	
Alt.		— 65	11	00			
Rem.		18	30	30	" sine	9.50167	
						2)18.66670	
		10h	20m	32s	= sine	9.33335	
Tab. cor.	—			04			
L. A. T.		10	20	28			
Equa. of time	—			45		3h = 45°	
L. M. T.		10	19	43	A. M.	59m = 14 45′	
G. M. T.		2	19	13	P. M.	30s = 7 30″	
Long.		3	59	30		Long. 59 52 30 W.	

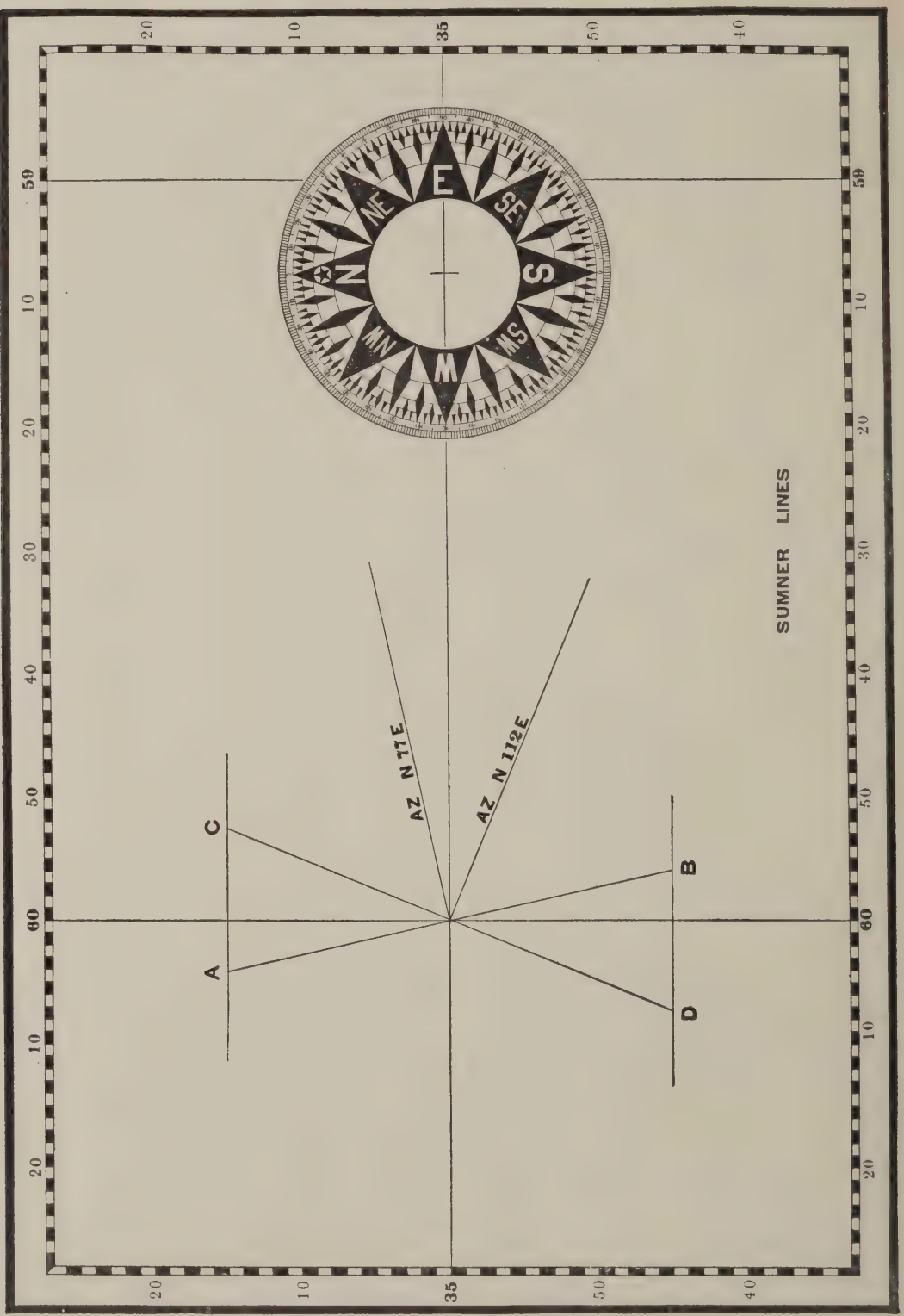
D

Alt.		65°	11′	00″			
Lat.		34	45	00	Log. secant	.08531	
P. D.		66	57	01	" cosecant	.03613	
		2)166	53	01			
½ sum		83	26	30	" cosine	9.05771	
Alt.		— 65	11	00			
Rem.		18	15	30	" sine	9.49596	
						2)18.67511	
		10h	19m	28s	= sine	9.33755	
Tab. cor.	+			01			
L. A. T.		10	19	29		4h = 60°	
Equa. of time	—			45		00m = 0 00′	
L. M T.		10	18	44	A. M.	29s = 7 15″	
G. M. T.		2	19	13	P. M.	Long. 60 07 15 W	
Long.		4	00	29			

Having placed these longitudes on the chart in their respective latitudes, two lines of position are obtained. The result of the first observation is the line A B and is crossed by the line C D, which is the result of the second observation, in latitude 35° 0′ 0″ N., and longitude 60° 0′ 0″ W., which is the ship's position. The sun's true azimuth is at right angle to these lines of position, and at the time of the first observation it was N. 77° E., and at the time of the second observation N. 112° E. Had the compass azimuth been obtained at the instant of each observation, the compass error and deviation could readily be determined as explained on page 67.

Hoboken, N. J., Nov. 1, 1901.
Mr. H. Louderbough.
Dear Sir.—For a number of years we have used the productions of R. F. Seaman & Co., consisting of "Iron Crown Paint" for Iron Vessels, Anti-Corrosive and Anti-Fouling Paints and Wetterstedt Copper Paint, and since you have purchased this business, we are free to note, that your manufacturing of these Paints has made them better as they run more unform than they did, and are easier to apply, being ground better. Yours truly,
THE TIETJEN & LANG DRY DOCK CO.

Gloucester, Mass., Sept. 1, 1901.
Mr. H. Louderbough.
Dear Sir.—As painters of Vessels hauling on the Railways of Gloucester, after several years' trial of the many manufactured copper Paints, we can endorse your "New Jersey" Copper paint to be without question, the best Paint we have ever used; it being finely ground, making a very smooth bottom, and also a good Anti-Fouler; these two good qualities have made it a great favorite with our customers and ourselves. I remain, yours truly,
JOS. B. MAGUIRE & S SON.


E
SE
S
SW
W
NW
N
NE
SUMNER LINES
AZ N 77E
AZ N 112E
A
B
C
D

American Shipping.

The importance of the upbuilding of our merchant marine has been foremost in the minds of our statesmen for many a year, while our politicians have forgotten all about it and the labor leaders do not seem to even consider it. We furnish the trade, and foreign capital and labor produce the vessels in which it is carried. They carry about 91 per cent of our commerce, we carry the balance. There is no good reason why the United States should be entirely dependent upon foreign vessels for carrying its commerce. There is no good reason why we should not have a merchant marine sufficient to carry our fair share of the trade between the United States and the ports of the world.

Something that the labor leaders should think of is the value of a ship as a wage producer; in building, the labor bill is about 85 per cent. of the cost, and, when built, she gives employment to a multiplicity of trades all the time as the steam and sailing vessels support a large number of diversified interests, such as ship-chandler, commission merchant, sail-maker, ship carpenter, caulker, rigger, stevedore, marine paint manufacturer and dry dock and railway, paying out more wages per year per dollar of investment than any other commercial enterprise.

Our freight bills amount to over $150,000,000.00 per year and we certainly ought to see to it that we pay most of that money back to our own citizens for their own benefit. In 1789 we were carrying 17 per cent of our imports and 30 per cent of our exports; one of the first acts of our first Congress was to establish a tonnage tax of 6 cents on home vessels and 50 cents on foreign vessels entering our ports, and a rebate of 10 per cent of tariff duties on goods imported in American vessels. These measures passed and the result of these enactments was that our merchant marine advanced by giant strides, so that in 1794 we carried 91 per cent of our imports and 86 per cent of our exports in American vessels. High water mark was reached in 1825, when we carried in American ships 95 per cent. of our imports and 89 per cent of our exports.

William McKinley said, "The policy of discriminating duties which prevailed in the early years of our history should be again promptly adopted by Congress and vigorously supported until our prestige and supremacy on the high seas are fully maintained."

For the first time in 100 years not a ship is under contract in the United States or being built for American commerce on the high seas; when those now built are worn out, the American flag will disappear from the oceans of the world.

The tonnage on our Great Lakes alone exceeds in capacity the merchant marine of any other nation, except Germany or Great Britain, we can thank our wise coasting laws for this protection. In the last seven years Congress appropriated over $238,000,000.00 for railroad subsidies, and if a portion of that had been used on our merchant marine we would have been better off; will some one explain why we, with a tariff for "Protection to American Industries," protect everything but our ships; now they need it the most, and look what that would mean in wages to labor.

Great Britain pays annually in subsidies over $6,000,000.00; France, over $7,000,000.00; Austria-Hungary, over $1,724,000.00 with her little commerce; Spain paid $1,629,000.00 to one line alone last year; Japan, over $3,492,000.00 (keep the little Jap ever before you as an example in this way, well worthy of emulation); and we pay $988,000.00 annually for subsidies. In this respect, we are asleep, we must wake up and thoroughly resolve that each and every one of us will hustle to put our starry flag ahead of them all on the seas and, once there, NAIL IT THERE.

The Toredo Worm.

There are several species of toredo worm in the United States, but the one we consider most harmful is generally known as Toredo navalis, a marine wood borer which is and has been for many years ravaging timber structures and ship bottoms in salt water.

The toredo worm, as generally found, is from 6 to 16 inches long, and of a diameter from ¼ to ½ inch, with a smooth, translucent body of a substance similar to that of a clam or oyster. At one end it is equipped with a boring shell and at the other end are the separate extremities of two tubes which are continous through the body, one serving to take in, from the outside, air, water and food for the support of the animal, and the other to carry out the refuse, due both to the boring and the physical processes which sustain its life. These tube terminals are kept at the exterior of the timber, where the toredo worm first enters, and keeps up communication with the outer water.

When the toredo worm enters a piece of wood, it is very small, about the size of a small pinhead, but it enlarges soon after entry and develops rapidly. The most noticeable points of the animal are these: it must always command the opening to the water and it objects to crossing a track; on the latter account it does not readily attack piles on which the bark has been retained, avoiding the junction between the bark and the wood.

In order to limit the destructive action of this animal on the bottoms of ships various protective devices have been tried, but only copper paint as a protective coat has been found effective; other poisonous paints are affected by salt water and other conditions, and after much experimenting, experience has proven that a properly compounded copper paint has been a great success.

Pole Star Table for 1905, 1906 and 1907.

The correction for the altitude of the Pole Star is to be taken from this table and applied the same as explained under the instructions for working that observation. The only difference being that the correction is given for every five minutes of the local sidereal time.

Sid. Time	Correction.	Sid. Time	Sid. Time	Correction	Sid. Time
h. m.	— +	h. m.	h. m.	— +	h. m.
0 00	1° 06′ 49″	12 00	6 00	0° 26′ 02″	18 00
05	^ 1 07 22 ^	5	5	^ 24 34 ^	5
10	1 07 53 |	10	10 |	23 05 |	10
15	1 08 22 |	15	15 v	21 36 |	15
20	1 08 49 |	20	20 |	20 06 |	20
25	1 09 15 |	25	25 |	18 36 v	25
30	1 09 38 |	30	30 |	17 05 |	30
35	1 09 59 |	35	35 |	15 34 |	35
40	1 10 19 |	40	40 |	14 02 | ADD	40
45	1 10 36 |	45	45 |	12 29 |	45
50	1 10 52 |	50	50 |	10 57 |	50
55	1 11 05 |	55	55 |	9 24 ^	55
1 00	1 11 16 |	13 00	7 00 |	7 51 |	19 00
5	1 11 25 |	5	5 ^	6 17 |	5
10	1 11 32 |	10	10 |	4 44 |	10
15	1 11 38 |	15	15 v	3 10 v	15
20	1 11 41 |	20	20 |	1 37 |	20
25	1 11 42 |	25	25 —	0 03 +	25
30	1 11 41 |	30	30 +	1 31 —	30
35	1 11 38 |	35	35 |	3 54 |	35
40	1 11 33 |	40	40 ^	4 38 ^	40
45	1 11 26 |	45	45 |	6 13 |	45
50	1 11 17 |	50	50 |	7 46 |	50
55	1 11 06 |	55	55 |	9 19 |	55
2 00	1 10 52 |	14 00	8 00 |	10 52 |	20 00
5	1 10 37 |	5	5 |	12 25 |	5
10	1 10 20 |	10	10 |	13 57 |	10
15	1 10 01 |	15	15 |	15 29 |	15
20	1 10 39 |	20	20 |	17 00 |	20
25 v	1 09 16 |	25	25 |	18 31 |	25
30	1 08 51 v	30	30 |	20 01 |	30
35	1 08 23 |	35	35 |	21 31 |	35
40	1 07 55 |	40	40 |	23 01 |	40
45	1 07 23 |	45	45 |	24 29 |	45
50	1 06 50 |	50	50 |	25 27 |	50
55	1 06 16 |	55	55 |	27 24 |	55
3 00	1 05 38 |	15 00	9 00 |	28 50 |	21 00
5	1 05 00 |	5	5 |	29 35 |	5
10	1 04 19 |	10	10 |	31 40 |	10
15	1 03 37 |	15	15 |	33 04 |	15
20	1 02 53 |	20	20 |	34 27 |	20
25	1 02 07 ^	25	25 |	35 49 v	25
30 ^	1 01 19 ^	30	30 |	37 10 |	30
35	1 00 29 |	35	35 v	38 29 |	35
40	59 38 |	40	40 |	39 48 |	40
45	58 46 |	45	45 |	41 05 |	45
50	57 51 |	50	50 |	42 22 |	50
55	56 55 |	55	55 |	43 37 |	55
4 00	55 56 |	16 00	10 00 ^	44 51 |	22 00
5	54 57 |	5	5 |	46 04 |	5
10	53 56 |	10	10 |	47 14 ^	10
15	52 53 |	15	15 |	48 25 |	15
20	51 49 |	20	20 |	49 33 |	20
25	50 44 |	25	25 |	50 40 |	25
30	49 37 |	30	30 |	51 46 |	30
35	48 28 |	35	35 |	52 50 |	35
40	47 19 |	40	40 |	53 53 |	40
45	46 07 |	45	45 |	54 54 |	45
50	44 55 |	50	50 |	55 53 |	50
55	43 41 |	55	55 |	56 52 |	55
5 00	42 26 |	17 00	11 00 |	57 48 |	23 00
5	41 10 |	5	5 |	58 43 |	5
10	39 52 |	10	10 |	59 35 |	10
15	38 34 |	15	15 | 1	00 27 |	15
20	37 14 |	20	20 | 1	01 17 |	20
25	35 53 |	25	25 | 1	02 04 |	25
30	34 31 |	30	30 | 1	02 50 |	30
35	33 08 |	35	35 | 1	03 35 |	35
40	31 45 |	40	40 | 1	04 17 |	40
45	30 20 |	45	45 | 1	04 58 |	45
50	28 55 v	50	50 | 1	05 37 |	50
55 v	27 29 v	55	55 v 1	06 14 v	55
6 00	— 26 02 +	18 00	12 00 + 1	06 49 —	24 00

SUBTRACT — ADD — SUBTRACT — ADD

Observe an altitude at any time and correct it for instrumental error, dip and refraction. To the local mean time, add the Sidereal Time from the Nautical Almanac (page 2 of the month) and the correction for the Greenwich time from table 9, and the result will be the Local Sidereal Time, and with it enter Pole Star Table on this page and take out the corresponding correction and apply to true altitude according to sign. The result will be the latitude.

If local apparent time is used, take the sun's right ascension instead of the Sidereal time from the Nautical Almanac.

To find the Greenwich time, in west longitude, add the longitude in time to the local time. In east longitude, subtract the longitude in time from the local time.

The local time must be the hours past the last noon, and the Sidereal time or sun's right ascension must be taken from the almanac for the date corresponding to the last noon. When the local Sidereal time is more than 24h, subtract 24h from it.

Example: December 6, 1902. The observed altitude of the Pole Star was 38° 10′ 30″. Local mean time 8h 04m 00s P. M. I. C. + 4′ 10″. Longitude 67° 30′ W. Height of eye 30 feet.

L. M. T.	8h 04m 00s P.M.	Obs. alt.	38° 10′ 30″
Long. 67° 30′	−4 30 00	I. C.	+ 4 10
G. M. T.	12 34 00		38 14 40
		Dip	— 5 22
			38 09 18
L. M. T.	8h 04m 00s	Ref.	— 1 14
Sid. time	16 57 20	True alt.	38 08 04
Table 9	2 04	Cor. for L. S. T—1	12 30
	25 03 24	Lat.	36 55 34 N.
	24 00 00		
L. S. T.	1 03 24		

Example: April 19, 1902. The observed altitude of the Pole Star was 42° 03′ 20″. Local apparent time 4h 57m A. M. Longitude 37° 30′ W. Height of eye 42 feet.

L. A. T.	4h	57m	00s A. M.
	12	00	00
Past last noon, 18th	16	57	00
Long. 37° 30′ =	2	30	00
G. A. T. past last noon, 18th	19	27	00

Obs. alt.	42°	03′	20″
Dip	—	6	12
	41	57	08
Ref.	—	1	05
True alt.	41	56	03
Cor for L. S. T.	+	13	42
Lat.	42	09	45 N.

L. A. T.	16h	57m	00s
Sun's R. A.	1	42	11
Cor.		3	12
L. S. T.	18	42	23

Example: January 8, 1902. The observed altitude of the Pole Star was 20° 08′. Local mean time 5h 40m A. M. Longitude 60° E. Height of eye 35 feet.

L. M. T.	5h	40m	00s A. M.
	12	00	00
Past last noon, 7th	17	40	00
Long. 60° E	4	00	00
G. M. T.	13	40	00

Obs. alt.	20°	08′	00″
Dip	—	5	48
	20	02	12
Ref.	—	2	39
True alt.	19	59	33
Cor. L. S. T.	+ 1	12	06
Lat.	21	11	39 N.

L. M. T	17h	40m	00s
Sid. time	19	04	28
Table 9		2	15
	36	46	43
	24	00	00
L. S. T.	12	46	43

Note the Positive Expressions of Quality in the following Testimonials. This Verdict is from Users of Copper Paint, that "New Jersey" Copper Paint leads them all.

New London, Conn., Nov. 12, 1901.

Mr. Harry Louderbough.

Dear Sir.—A number of our barges and floating property have been painted with your "New Jersey" Copper Paint, and in our experience we have found it a very desirable and durable Paint. Its smoothness also, is a strong recommend for it, especially on large barges that are moved around our coast, as the resistance is greatly diminished by the Paint being finely ground, making a smooth surface.

Yours very truly,

THE THAMES TOW BOAT CO.

Port Hawkesbury, C. B., Dec. 29, 1898.

Harry Louderbough, Esq.,

Jersey City, N. J., U. S. A.

Dear Sir.—We received the enclosed yesterday from Capt. Kelly, of the Steamer "John L. Cann," plying between Mulgrave and Canos, Nova Scotia.

Mulgrave, N. S., Dec. 28, 1898.

Messrs. Peter Paint & Sons,

Port Hawkesbury, C. B.

Dear Sirs.—We painted our Steamer "John L. Cann's" bottom with your "New Jersey" Copper Paint on August last, a little over four months ago. During that time our Steamer has kept clean and in better condition than ever before.

We have used a number of different kinds of copper paint and never before had the satisfaction we have had from your Copper Paint.

I think it my duty to express the great satisfaction of having our Steamer clean under circumstances similar where other copper paints have failed. I may state that our speed on a run of nine miles had not reduced one minute since we applied the "New Jersey" Copper Paint. With other paints our time has been lengthened eight minutes. Yours truly,

A. H. KELLY, (Capt. Stmr. Cann.)

It was quite unexpected on our part, for the fact is that it came unsolicited. Yours truly,

PETER PAINT & SONS.

Hoboken, March 24, 1891.

Mr. H. Louderbough.

Dear Sir.—The New Jersey Seam Paint purchased from you gives us splendid satisfaction, being of good weight and holding up well in the seams of vessels. We prefer it to all others. Very truly,

TIETJEN & LANG.

Cambridge, Md., Oct. 1, 1901.

Mr. H. Louderbough.

Dear Sir.—It is with great pleasure that I express to you my appreciation of the good qualities of your New Jersey Copper Paint that, in the few years it has been sold, has become such a favorite among our oystermen for its smoothness, giving a good sailing bottom, and as an Anti-Fouler resisted the encroachments of the barnacle, so very troublesome in the waters of our bay. I remain, yours truly,

RICHARDSON & DAVIS.

New York, March 24, 1891.

H. Louderbough.

Dear Sir.—During the past two seasons we have used at our Dry Dock at Pier No. 52, E. R., your New Jersey Copper Paint, and we are indeed greatly pleased with it. It is easy to apply, and makes a very smooth bottom.

JENKINS & TREGARTHEN.

The Sextant and Octant.

The sextant or some similar instrument is used by navigators to measure angular distances between either celestial or terrestial objects, and without it accurate observations for the determination of a ship's position would not be possible.

The arc of the sextant is divided to degrees, each of which is subdivided to ten minutes (′), and by the use of the vernier, angles are read to ten seconds (″).

To read off an altitude, note the first division on the arc to the right of the zero on the vernier, and then follow along the vernier to the left and the first division which coincides exactly with one on the arc will give the odd minutes and seconds of the reading. Figure one represents the vernier and part of the arc of a sextant cut to ten seconds. Each degree is divided to ten minutes. The zero on the vernier is between 20° 10′ and 20° 20′. Look along the vernier and the fifth line past three will be found to cut a line exactly on the arc. As each minute on the vernier is divided to ten seconds, the reading is 3′ 50″, which, when added to that on the arc, will give 20° 13′ 50″. If the zero on the vernier exactly cuts a line on the arc, there will be no odd minutes or seconds shown on the vernier.

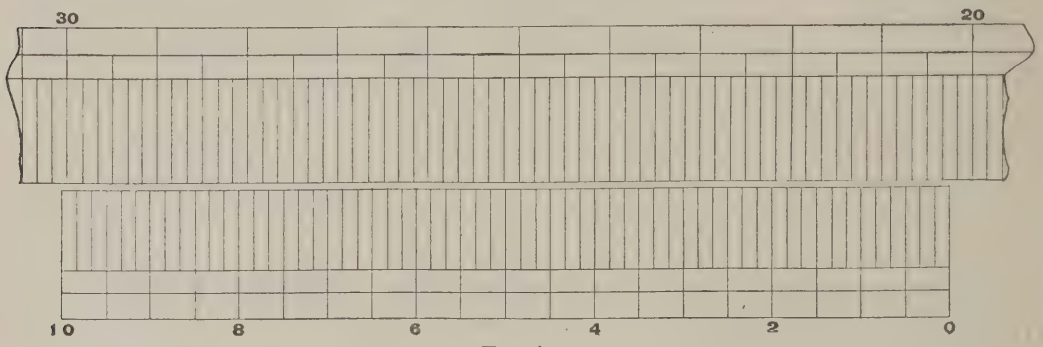


Fig. 1.

All altitudes or other angular distances measured with the sextant are read in this manner.

When the zero on the vernier is to the left of that on the arc, the angle is said to be "on the arc," but to the right "off the arc." This applies to the index error which is the quantity a sextant may indicate more or less than the truth, and is the result of the index and horizon mirrors being parallel to each other when the zero on the vernier and that on the arc do not cut exactly. In other words, if the zero on the vernier and that on the arc coincide exactly, there will be index error if the horizon and index mirrors are not exactly parallel to each other. It is preferable to have the sextant correct as it only means additional labor to apply the error, and there always exists a possible chance of neglecting its use, in which case the result of the observation will not be correct. In fact, the instrument is supposed to be properly adjusted if possible and only use a correction when the adjustment cannot be made; but at sea or in ports where good repairs cannot be made, it is a wise plan to not disturb the adjusting screws unless absolutely necessary, as they are brass and are easily broken or injured.

When the zero on the vernier is to the left of that on the arc, the index error is read the same as any other angle and is to be subtracted from all altitudes observed. If the zero on the vernier is to the right of that on the arc, as shown in Figure two, it is read from the left towards the right. In this case the reading is less than ten minutes "off the arc." Reading from the left to right, the fifth division to the right of three minutes cuts a division on the arc exactly. This reading, called the index correction, is 3′ 50″ and is to be added to all altitudes or

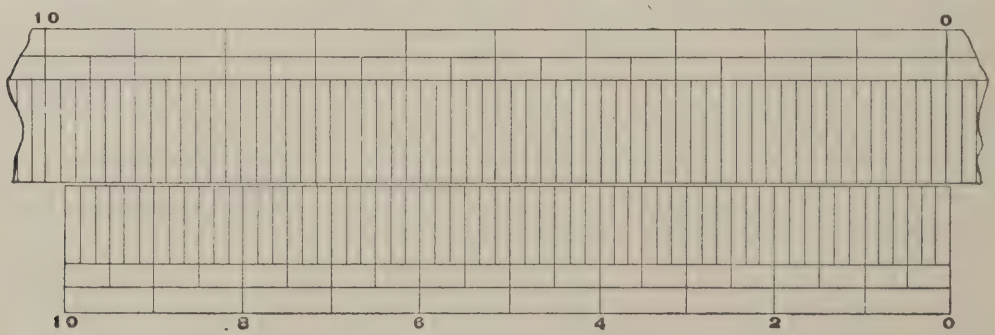


Fig. 2.

other angles measured. The divisions to the right of the zero on the arc are called the extra arc or arc of excess.

The index error may be found by moving the index bar until the horizon shows an unbroken line through the horizon glass.

A more accurate method is to measure the diameter of the sun on the arc and off. Half the difference between them will be the index correction. If the greater reading is off the arc, it is added to, and if the greater reading is on the arc, it is subtracted from the altitudes measured. To prove the correctness of the error thus found, add together the two diameters of the sun measured and divide them by four, and the result should be the same as the sun's semi-diameter in the Nautical Almanac for that day.

Example: May 16, 1902. The sun's diameter measured as follows: On the arc 33′ 10″. Off the arc 30′ 10″. Find the index error and prove it.

Reading on the arc	33′	10″		33′	10″
Reading off the arc	30	10		30	10
	2) 3	00		4)63	20
Index error subtractive	1	30	Semi-diam N. A.	= 15	50

The index error found is 1′ 30″ subtractive because the greater reading is on the arc, and its correctness is proven because the sum of the two readings divided by four corresponds with the sun's semi-diameter given in the Nautical Almanac for May 16, 1902—the date of the observation.

The principle of reading the sextant applies to the other reflecting instruments used by navigators, which are divided differently. The octant has four divisions to each degree on the arc and to each minute on the vernier. Then each division on the arc represents 15′ and on the vernier 15″, as in Figure three, which shows part of the arc of an octant and the vernier.

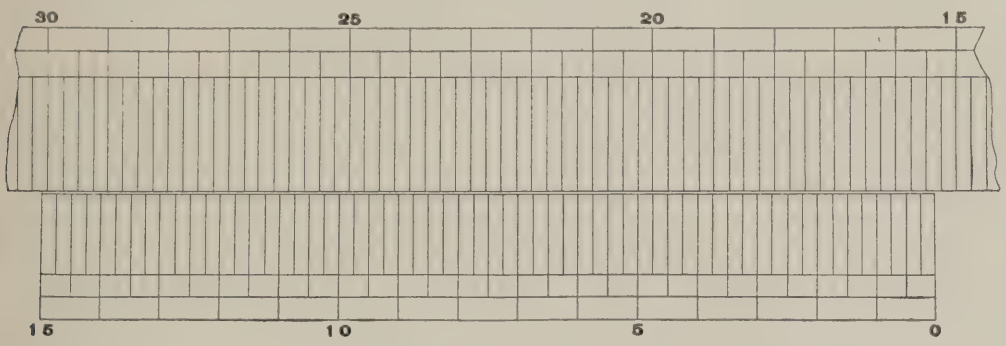


Fig. 3.

To read off an altitude, note the first division on the arc to the right of the zero on the vernier, and then follow along the vernier to the left and the first division which coincides exactly with one on the arc will give the odd minutes and seconds of the reading. The zero of the vernier in Figure three is between 15° 15′ and 15° 30′. Look along the vernier and the first line to the left of five, which is 5′ 15″, exactly cuts a division on the arc. This added to the 15° 15′ on the arc makes the reading 15° 20′ 15″. These two instruments are the ones most generally used by navigators and are to be preferred to the less expensive ones which, strange as it may seem, are somewhat extensively used in the smaller vessels.

Figure four shows one of these, the degrees on the arc of which is divided into three divisions of twenty minutes each, with a vernier cut to half minutes or thirty seconds.

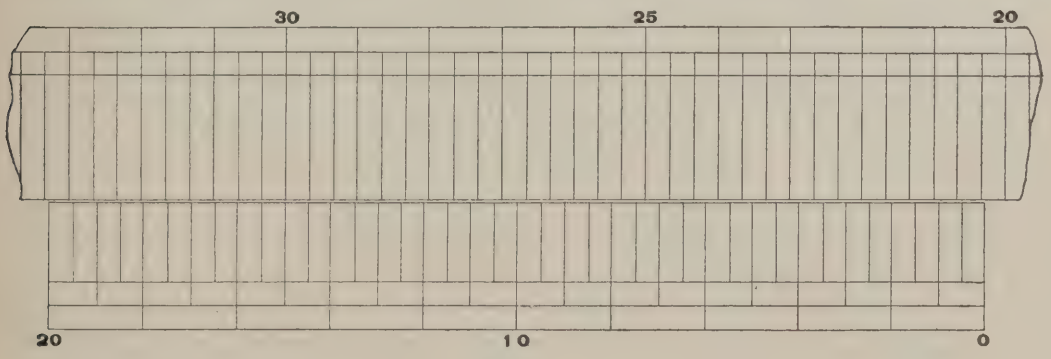


Fig. 4.

Following the same rule used in reading the sextant and octant, Figure four will be found to read 20° 15′ 30″. The objection to this instrument and others cut to less than fifteen seconds, is that the altitudes measured are not sufficiently exact. Even with a fine sextant, the error of the observed altitude is sometimes as great as thirty seconds when no telescope is used.

Another of these instruments is shown in Figure five. The arc in this case is divided to twenty minutes and the vernier to minutes. By this instrument, only minutes can be read from the vernier.

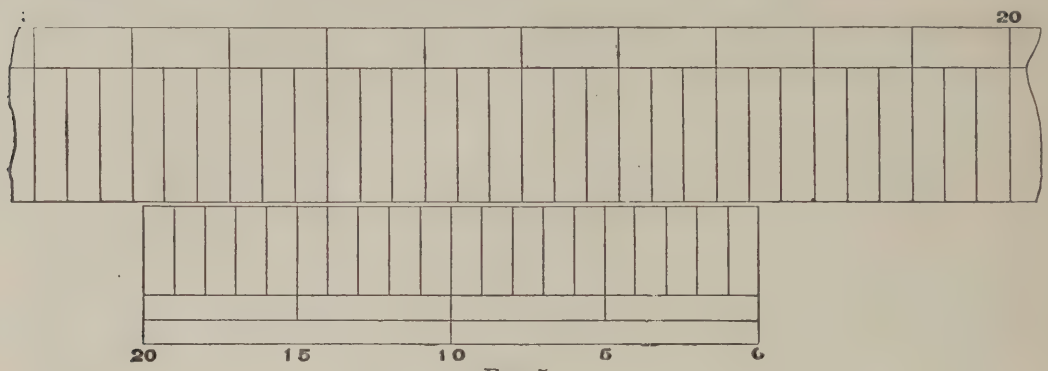


FIG. 5.

The zero on the vernier is between 22° 20′ and 22° 40′ on the arc. Look along the vernier for the odd minutes, which are fourteen. This added to the reading on the arc gives 22° 34′ 00″.

ADJUSTMENTS OF THE SEXTANT.

FIRST. Move the vernier to about the middle of the arc and holding the instrument with the index mirror towards the eye, and if the true and reflected arcs show in an unbroken line in the index mirror, it is perpendicular to the plane of the instrument. If the arcs show in a broken line, the glass is not perpendicular and requires adjustment, which is effected by use of the outer screw back of the glass.

SECOND. Make the zero on the vernier coincide exactly with that on the arc, and to be exact, the last division on the vernier must also coincide exactly with one on the arc, then clamp the instrument firmly and hold it face up, looking through the sight tube, see if the true and reflected horizons show in an unbroken line through the horizon mirror. If they do, the glass is perpendicular to the plane of the instrument. If in a broken line, the glass is not perpendicular and requires adjustment, which is effected by use of the key under the horizon glass. Some instruments have a fixed horizon, in which case the adjustment is made by moving the glass only with the screws.

THIRD. Keeping the zero on the vernier clamped at zero on the arc, hold the instrument vertically or in the position for observing altitudes, and if the horizon and index mirrors are parallel to each other, the horizon will appear in an unbroken line through the horizon glass. If it appears in a broken line, adjustment is necessary. This is effected by the screws, using the pin to turn them. If the horizon is a fixed one, the adjustment is made by moving the glass only with the screw.

FOURTH. The axis of the telescope must be parallel to the plane of the instrument. Screw in the telescope so that one pair of wires will be parallel to the plane of the instrument. Measure the angular distance between two stars not nearer than ninety degrees from each other, making the contact on the wire nearest the plane of the instrument and clamp it. By a slight change in the position of the instrument, make the contact on the other wire, and if it is perfect, the axis of the telescope is parallel to the plane of the instrument. If the contact is imperfect, the adjustment is made by slacking or setting up the screws in the collar in which the telescope is screwed; but before setting up one of these screws, the other must be slacked, and when the adjustment is complete both screws must be tight.

The adjustment for the quadrant are the same as those for the sextant, except that of the telescope, this instrument having none.

In case the adjustments cannot be made, find the index error and apply it to any angle measured.

LENGTH OF A DEGREE OF LONGITUDE IN EACH DEGREE OF LATITUDE.

Lat.	Length Deg. Long.	Lat.	Length Deg. Long.	Lat.	Length Deg. Long.
°		°	′	°	′
1	60 0	31	51.4	61	29 1
2	60 0	32	50 9	62	28 2
3	59 9	33	50 3	63	27 2
4	59.9	34	49 7	64	26.3
5	59.8	35	49.1	65	25 4
6	59 7	36	48 5	66	24.4
7	59.6	37	47.9	67	23 4
8	59 4	38	47.3	68	22.5
9	59 3	39	46 6	69	21.5
10	59.1	40	46 0	70	20.5
11	58 9	41	45 3	71	19.5
12	58 7	42	44 6	72	18.5
13	58.5	43	43.9	73	17 5
14	58.2	44	43 2	74	16.5
15	58 0	45	42.4	75	15.5
16	57.7	46	41.7	76	14 5
17	57.4	47	40 9	77	13 5
18	57 1	48	40 1	78	12 5
19	56.7	49	39 4	79	11 4
20	56.4	50	38 6	80	10.4
21	56 0	51	37 8	81	9 4
22	55 6	52	36 9	82	8 4
23	55.2	53	36.1	83	7 3
24	54.8	54	35 3	84	6.3
25	54.4	55	34 4	85	5 2
26	53.9	56	33 6	86	4.2
27	53.5	57	32 7	87	3.1
28	53 0	58	31 8	88	2 1
29	52.5	59	30.9	89	1.0
30	52 0	60	30.0	90	.0

TABLE FOR FINDING DISTANCE OFF BY TWO BEARINGS AND THE DISTANCE RUN.

DIFFERENCE BETWEEN COURSE AND SECOND BEARING-POINTS.	Points.	DIFFERENCE BETWEEN COURSE AND FIRST BEARING-POINTS.															
		2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10
	4	1.00																
	4½	0.81	1.23															
	5	0 69	1.00	1.45														
	5½	0 60	0 85	1 17	1.66													
	6	0 54	0.74	1.00	1 35	1.85												
	6½	0.49	0 67	0 88	1.14	1.50	2 02											
	7	0.46	0.61	0 79	1.00	1.27	1 64	2.17										
	7½	0.43	0 57	0 72	0.90	1.11	1.39	1 77	2 30									
	8	0.41	0.53	0 67	0 82	1 00	1 22	1.50	1.87	2.41								
	8½	0.40	0 51	0.63	0.76	0.92	1.09	1.31	1.58	1 96	2.50							
	9	0 39	0 49	0 60	0 72	0 85	1.00	1.18	1.39	1.66	2 08	2 56						
	9½	0 38	0.48	0 58	0 69	0 80	0 93	1 08	1.25	1 46	1.72	2.08	2 60					
	10	0 38	0 47	0.57	0.66	0.76	0.88	1 00	1 14	1.31	1.51	1 76	2 11	2 61				
	10½	0 38	0 47	0.56	0 65	0 74	0.84	0.94	1.06	1 19	1 35	1 55	1 79	2 12	2.60			
	11	0.39	0 47	0.56	0 64	0 72	0 81	0 90	1.00	1.11	1 24	1 39	1 57	1 80	2 11	2 56		
	11½	0 40	0 48	0.56	0 64	0.71	0 79	0 87	0.95	1.05	1.15	1 27	1 41	1 58	1.79	2 08	2.50	
	12	0.41	0.49	0.57	0.64	0.71	0 78	0 85	0 92	1.00	1 08	1 18	1.29	1.41	1.57	1.76	2 08	2.41

Example: Ship steering N. by E. had Barnegat light bearing N. N. W., and then run 12 miles, when the light bore W. by N.

Diff. between course and 1st bearing	3 points.
" " " " 2d "	8 "
Number corresponding	0.67
Distance	× 12
Dist. off Barnegat at 2d bearing	8.04 miles.

Use "New Jersey" Seam Paint and do away with your pitch pot before you have a fire.

TABLES FOR TURNING LONGITUDE INTO TIME AND THE CONTRARY.

Longitude into Time.

°	H.	M.	°	H.	M.	°	H.	M.
′	M.	S.	′	M.	S.	′	M.	S.
1	0	04	61	4	04	121	8	04
2	0	08	62	4	08	122	8	08
3	0	12	63	4	12	123	8	12
4	0	16	64	4	16	124	8	16
5	0	20	65	4	20	125	8	20
6	0	24	66	4	24	126	8	24
7	0	28	67	4	28	127	8	28
8	0	32	68	4	32	128	8	32
9	0	36	69	4	36	129	8	36
10	0	40	70	4	40	130	8	40
11	0	44	71	4	44	131	8	44
12	0	48	72	4	48	132	8	48
13	0	52	73	4	52	133	8	52
14	0	56	74	4	56	134	8	56
15	1	00	75	5	00	135	9	00
16	1	04	76	5	04	136	9	04
17	1	08	77	5	08	137	9	08
18	1	12	78	5	12	138	9	12
19	1	16	79	5	16	139	9	16
20	1	20	80	5	20	140	9	20
21	1	24	81	5	24	141	9	24
22	1	28	82	5	28	142	9	28
23	1	32	83	5	32	143	9	32
24	1	36	84	5	36	144	9	36
25	1	40	85	5	40	145	9	40
26	1	44	86	5	44	146	9	44
27	1	48	87	5	48	147	9	48
28	1	52	88	5	52	148	9	52
29	1	56	89	5	56	149	9	56
30	2	00	90	6	00	150	10	00
31	2	04	91	6	04	151	10	04
32	2	08	92	6	08	152	10	08
33	2	12	93	6	12	153	10	12
34	2	16	94	6	16	154	10	16
35	2	20	95	6	20	155	10	20
36	2	24	96	6	24	156	10	24
37	2	28	97	6	28	157	10	28
38	2	32	98	6	32	158	10	32
39	2	36	99	6	36	159	10	36
40	2	40	100	6	40	160	10	40
41	2	44	101	6	44	161	10	44
42	2	48	102	6	48	162	10	48
43	2	52	103	6	52	163	10	52
44	2	56	104	6	56	164	10	56
45	3	00	105	7	00	165	11	00
46	3	04	106	7	04	166	11	04
47	3	08	107	7	08	167	11	08
48	3	12	108	7	12	168	11	12
49	3	16	109	7	16	169	11	16
50	3	20	110	7	20	170	11	20
51	3	24	111	7	24	171	11	24
52	3	28	112	7	28	172	11	28
53	3	32	113	7	32	173	11	32
54	3	36	114	7	36	174	11	36
55	3	40	115	7	40	175	11	40
56	3	44	116	7	44	176	11	44
57	3	48	117	7	48	177	11	48
58	3	52	118	7	52	178	11	52
59	3	56	119	7	56	179	11	56
60	4	00	120	8	00	180	12	00

Example: Turn 73° 53′ 42″ into time.

73°	=	4h.	52m.
53′	=	3	32s
42′	=		2.8
Ans.		4	55 34.8

Time into Longitude.

Time. Hours.	Arc. Degrees.
1	15
2	30
3	45
4	60
5	75
6	90
7	105
8	120
9	135
10	150
11	165
12	180

Time. Minutes.	Arc. Deg.	Arc. Min.
1	0	15
2	0	30
3	0	45
4	1	00
5	1	15
6	1	30
7	1	45
8	2	00
9	2	15
10	2	30
11	2	45
12	3	00
13	3	15
14	3	30
15	3	45
16	4	00
17	4	15
18	4	30
19	4	45
20	5	00
21	5	15
22	5	30
23	5	45
24	6	00
25	6	15
26	6	30
27	6	45
28	7	00
29	7	15
30	7	30
31	7	45
32	8	00
33	8	15
34	8	30
35	8	45
36	9	00
37	9	15
38	9	30
39	9	45
40	10	00
41	10	15
42	10	30
43	10	45
44	11	00
45	11	15
46	11	30
47	11	45
48	12	00
49	12	15
50	12	30
51	12	45
52	13	00
53	13	15
54	13	30
55	13	45
56	14	00
57	14	15
58	14	30
59	14	45
60	15	00

Time. Seconds.	Arc. Min.	Arc. Sec.
1	0	15
2	0	30
3	0	45
4	1	00
5	1	15
6	1	30
7	1	45
8	2	00
9	2	15
10	2	30
11	2	45
12	3	00
13	3	15
14	3	30
15	3	45
16	4	00
17	4	15
18	4	30
19	4	45
20	5	00
21	5	15
22	5	30
23	5	45
24	6	00
25	6	15
26	6	30
27	6	45
28	7	00
29	7	15
30	7	30
31	7	45
32	8	00
33	8	15
34	8	30
35	8	45
36	9	00
37	9	15
38	9	30
39	9	45
40	10	00
41	10	15
42	10	30
43	10	45
44	11	00
45	11	15
46	11	30
47	11	45
48	12	00
49	12	15
50	12	30
51	12	45
52	13	00
53	13	15
54	13	30
55	13	45
56	14	00
57	14	15
58	14	30
59	14	45
60	15	00

Example: Turn 3h 11m 17s into arc.

3h	=	45°		
11m	=	2	45′	
17s	=		4	15″
Ans.		47	49	15

WETTERSTEDT'S COPPER PAINT.

The First Copper Paint Made.

Patented England, 1846. France, 1847. United States, Aug. 5, 1851.

BEING FINELY GROUND, IT IS EASY TO APPLY, MAKING A SMOOTH SURFACE.

This table contains the correction to be added to the observed altitude of the sun's lower limb to obtain the true altitude of the sun's center. It embraces the four corrections—semi-diameter (16′ 00″), dip, mean refraction and parallax.

Obs alt. Sun's L. L.	HEIGHT OF THE EYE IN FEET.																	
	5	7	10	12	14	16	18	20	22	24	26	28	30	35	40	45	50
° ′	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
7 00	6 34	6 09	5 39	5 21	5 05	4 50	4 36	4 22	4 09	3 57	3 45	3 34	3 23	2 57	2 33	2 09	1 49
7 30	7 01	6 36	6 06	5 48	5 32	5 17	5 03	4 49	4 36	4 24	4 12	4 01	3 50	3 24	3 00	2 36	2 16
8 00	7 25	7 00	6 30	6 12	5 56	5 41	5 27	5 13	5 00	4 48	4 36	4 25	4 14	3 48	3 24	3 00	2 40
8 30	7 46	7 25	6 51	6 33	6 17	6 02	5 48	5 34	5 21	5 09	4 57	4 46	4 35	4 09	3 45	3 21	3 01
9 00	8 05	7 40	7 10	6 52	6 36	6 21	6 07	5 53	5 40	5 28	5 16	5 05	4 54	4 28	4 04	3 40	3 20
10 00	8 39	8 14	7 44	7 26	7 10	6 55	6 41	6 27	6 14	6 02	5 50	5 39	5 28	5 02	4 38	4 14	3 54
11 00	9 07	8 42	8 12	7 54	7 38	7 23	7 09	6 55	6 42	6 30	6 18	6 07	5 56	5 30	5 06	4 42	4 22
12 00	9 31	9 03	8 36	8 18	8 02	7 47	7 33	7 19	7 06	6 54	6 42	6 31	6 20	5 54	5 30	5 06	4 46
13 00	9 51	9 26	8 56	8 38	8 22	8 07	7 53	7 39	7 26	7 14	7 02	6 51	6 40	6 14	5 50	5 26	5 06
14 00	10 09	9 44	9 14	8 56	8 40	8 25	8 11	7 57	7 44	7 32	7 20	7 09	6 58	6 32	6 08	5 44	5 24
15 00	10 24	9 50	9 29	9 11	8 55	8 40	8 26	8 12	7 59	7 47	7 35	7 24	7 13	6 47	6 23	5 59	5 39
17 30	10 54	10 29	9 59	9 41	9 25	9 10	8 56	8 42	8 29	8 17	8 05	7 54	7 43	7 17	6 53	6 29	6 09
20 00	11 18	10 53	10 23	10 05	9 49	9 34	9 20	9 06	8 53	8 41	8 29	8 18	8 07	7 41	7 17	6 53	6 33
22 30	11 37	11 12	10 42	10 24	10 08	9 53	9 39	9 25	9 12	9 00	8 48	8 37	8 26	8 00	7 36	7 12	6 52
25 00	11 53	11 28	10 58	10 40	10 24	10 09	9 55	9 41	9 28	9 16	9 04	8 53	8 42	8 16	7 52	7 28	7 08
27 30	12 06	11 41	11 11	10 53	10 37	10 22	10 08	9 54	9 41	9 29	9 17	9 06	8 55	8 29	8 05	7 41	7 21
30 00	12 16	11 51	11 21	11 03	10 47	10 32	10 18	10 03	9 51	9 39	9 27	9 16	9 05	8 39	8 15	7 51	7 31
35 00	12 33	12 08	11 38	11 20	11 04	10 49	10 35	10 21	10 08	9 56	9 44	9 33	9 22	8 56	8 32	8 08	7 48
40 00	12 47	12 22	11 52	11 34	11 18	11 03	10 49	10 35	10 22	10 10	9 58	9 47	9 36	9 10	8 46	8 22	8 02
50 00	13 06	12 41	12 11	11 53	11 37	11 22	11 08	10 54	10 41	10 29	10 17	10 06	9 55	9 29	9 05	8 41	8 21
60 00	13 19	12 54	12 24	12 06	11 50	11 35	11 21	11 07	10 54	10 42	10 30	10 19	10 08	9 42	9 18	8 54	8 34
75 00	13 35	13 10	12 40	12 22	12 06	11 51	11 37	11 23	11 10	10 58	10 46	10 35	10 24	9 58	9 34	9 10	8 50
90 00	13 49	13 24	12 54	12 36	12 20	12 05	11 51	11 37	11 24	11 12	11 00	10 49	10 38	10 12	9 48	9 24	9 04

This table contains the correction for the month to be applied to the correction from the above table according to sign.

Day of the month.	MONTH.											
	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	+ 17″	+ 15″	+ 9″	+ 1″	− 7″	− 13″	− 15″	− 13″	− 8″	0″	+ 8″	+ 15″
10	+ 17	+ 13	+ 7	− 1	− 9	− 14	− 15	− 12	− 6	+ 2	+ 10	+ 16
20	+ 16	+ 11	+ 4	− 4	− 11	− 15	− 14	− 10	− 3	+ 5	+ 13	+ 17

This table contains the negative altitude corresponding to the height of the eye for finding the longitude by sun-rise and sun-set observations.

Sun's Limb.	HEIGHT OF THE EYE IN FEET.																
	5	7	10	12	14	16	18	20	22	24	26	28	30	35	40	45	50
L. L.	22′31″	22′56″	23′26″	23′44″	24′00″	24′15″	24′29″	24′43″	24′56″	25′08″	25′20″	25′31″	25′42″	26′08″	26′32″	26′56″	27′16′
U. L.	54 49	55 14	55 44	56 02	56 18	56 33	56 47	57 01	57 14	57 26	57 38	57 49	58 30	58 26	58 50	59 14	59 34

This table contains the correction for the month to be applied to the negative altitude as taken from the above table. When the upper limb is observed, apply the correction according to the sign; but if the lower limb is observed, apply it contrary to the sign.

Day of the Month.	MONTH.											
	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	+ 17″	+ 15″	+ 9″	+ 1″	− 7″	− 13″	− 15″	− 13″	− 8″	0″	+ 8″	+ 15″
10	+ 17	+ 13	+ 7	− 1	− 9	− 14	− 15	− 12	− 6	+ 2	+ 10	+ 16
20	+ 16	+ 11	+ 4	− 4	− 11	− 15	− 14	− 10	− 3	+ 5	+ 13	+ 17

Good Products are Well Advertised—
So is "New Jersey" Copper Paint.

ELEMENTS FROM THE NAUTICAL ALMANAC FOR THE YEAR 1902, TO BE USED IN WORKING THE SEVERAL PROBLEMS IN THIS WORK.

AT GREENWICH APPARENT NOON. I

Day of the Week.	Day of the Month.	THE SUN'S Apparent Right Ascension.			Diff. for 1 Hour.	Apparent Declination			Diff. for 1 Hour.	Semi-diameter.		Sidereal Time of Semi-diameter Passing Meridian.	Equation of Time, to be Added to / Subtracted from / Added to / Subtracted from Apparent Time.		Diff. for 1 Hour.
		h	m	s	s	°	′	″	″	′	″	s	m	s	s
JANUARY.															
Wed.	1	18	44	14.20	11.051	S. 23	03	38.1	11.68	16	17.13	71.02	3	25.09	1.192
Tues.	7	19	10	39.19	10.955	22	27	23.5	18.48	16	17.05	70.69	6	10.31	1.096
Thurs.	16	19	49	42.94	10.731	S. 21	03	26.3	28.01	16	16.63	69.97	9	44.46	0.872
FEBRUARY.															
Sat.	8	21	25	01.58	9.977	S. 15	11	17.0	47.15	16	13.79	67.46	14	21.56	0.120
Thurs.	27	22	38	35.83	9.420	S. 8	34	43.0	56.19	16	09.87	65.56	13	01.52	0.435
MARCH.															
Fri.	7	23	08	28.62	9.263	S. 5	31	23.3	58.20	16	07.90	64.99	11	22.16	0.591
Sat.	8	23	12	10.74	9.247	5	08	04.1	58.38	16	07.65	64.93	11	07.77	0.607
Mon.	10	23	19	33.86	9.217	4	21	13.8	58.69	16	07.13	64.83	10	37.87	0.638
Mon.	17	23	45	14.54	9.131	1	35	56.5	59.24	16	05.29	64.54	8	43.00	0.723
Fri.	21	23	59	49.56	9.101	0	01	08.6	59.22	16	04.20	64.44	7	31.99	0.754
Sat.	22	0	03	27.91	9.096	N. 0	22	32.2	59.18	16	03.93	64.42	7	13.84	0.759
Thurs.	27	0	21	38.49	9.085	N. 2	20	31.6	58.76	16	02.56	64.38	5	41.92	0.769
APRIL.															
Thurs.	17	1	38	28.19	9.256	N. 10	14	31.9	53.02	15	56.81	64.98	0	15.01	0.599
Sat.	18	1	42	10.52	9.271	10	35	39.3	52.59	15	56.55	65.04	0	29.20	0.584
Tues.	29	2	23	24.34	9.482	N. 14	15	17.6	46..8	15	53.76	65.77	2	37.10	0.373
MAY.															
Fri.	16	3	29	14.16	9.879	N. 18	56	41.1	35.16	15	50.00	67.14	3	48.52	0.023
JUNE.															
Wed.	11	5	14	47.27	10.356	N. 23	02	33.3	11.18	15	46.12	68.75	0	46.36	0.498
Mon.	16	5	35	32.09	10.387	N. 23	19	49.8	6.08	15	45.68	68.86	0	15.50	0.528
JULY.															
Mon.	14	7	32	12.94	10.149	N. 21	47	41.1	22.65	15	45.31	68.03	5	31.89	0.292
AUGUST.															
Sat.	9	9	13	38.29	9.529	N. 16	03	47.3	42.81	15	47.83	65 92	5	26.82	0.326
SEPTEMBER.															
Thurs.	18	11	40	15.22	8.966	N. 2	08	16.2	58.05	15	56.45	63.97	5	36.55	0.887
Tues.	23	11	53	11.77	8.981	N. 0	11	43.9	58.44	15	57.77	64 01	7	22.46	0.873
OCTOBER.															
Mon.	20	13	36	59.33	9.409	S. 10	06	02.7	54.11	16	05.18	65.52	15	00.54	0.445
NOVEMBER.															
Thurs	27	16	09	18.88	10.666	S. 21	00	51.9	28.07	16	13.90	69.76	12	30.49	0.807
DECEMBER.															
Wed.	3	16	35	07.43	10.835	S. 22	00	57.9	21.92	16	14.85	70.31	10	21.64	0.976
Sat.	6	16	48	10.20	10.906	22	25	21.1	18.69	16	15 25	70.55	9	08.74	1 046
Sat.	20	17	49	53.49	11.099	S. 23	25	45.1	2.07	16	16 67	71.18	2	38 31	1.239

II AT GREENWICH MEAN NOON.

Day of the Week	Day of the Month.	THE SUN'S Apparent Right Ascension. h	m	s	Diff. for 1 Hour. s	Apparent Declination. °	′	″	Diff. for 1 Hour. ″	Equation of Time, to be Subtracted from / Added to / Subtracted from / Added to Mean Time. m	s	Diff. for 1 Hour. s	Sidereal Time, or Right Ascension of Mean Sun. Diff. for 1 Hour. + 9s.8565 h	m	s
JANUARY.															
Wed.	1	18	44	13.57	11.047	S. 23	03	28.8	11.68	3	25.05	1.192	18	40	48.53
Tues.	7	19	10	38.07	10.952		22	27	25 4	18.46	6	10.20	1.096	19	04	27.87
Thur.	16	19	49	41.20	10.728	S. 21	03	30.8	27.99	9	44.32	0.872	19	38	56.88
FEBRUARY.															
Sat.	8	21	24	59.19	9.977	S. 15	11	28.3	47.14	14	21.53	0.120	21	10	37.66
Thur.	27	22	38	33.79	9.421	S. 8	34	55.2	56.19	13	01.61	0.435	22	25	32.18
MARCH.															
Fri.	7	23	03	26 87	9.265	S. 5	31	34.3	58.21	11	22.27	0.591	22	57	04.60
Sat.	8	23	12	09.03	9.249		5	08	14.9	58.39	11	07.88	0.607	23	01	01.15
Mon.	10	23	19	32.23	9.218		4	21	24.2	58.70	10	37.98	0.638	23	08	54.25
Mon.	17	23	45	13.22	9.133		1	36	05.1	59.25	8	43.12	0.723	23	36	30.12
Fri.	21	23	59	48.41	9.103	S.	0	01	16.1	59.23	7	32.09	0.754	23	52	16.32
Sat.	22	6	03	26.81	9.098	N.	0	22	25.0	59.19	7	13.93	0.759	23	56	12.88
Thur.	27	0	21	37.63	9.987	N.	0	20	26.0	58.77	5	41.99	0.769	0	15	55.64
APRIL.															
Thur.	17	1	38	28.23	9.258	N.	10	14	32.1	53 03	0	15.01	0.599	1	38	43.24
Sat.	18	1	42	10.59	9.273			10	35	39.7	52.60	0	29.20	0.584	1	42	39.79
Tues.	29	2	23	24.76	9.483	N.	14	15	19.6	46.98	2	37.12	0.373	2	26	01.88
MAY.															
Fri.	16	3	29	14.78	9.879	N.	18	56	43.3	35.16	3	48.52	0.023	3	33	03.30
JUNE.															
Wed.	11	5	14	47.41	10.355	N.	23	02	33.5	11.18	0	46.35	0.498	5	15	33.76
Mon.	16	5	35	32.05	10.386	N.	23	19	49.8	6.08	0	15.50	0.528	5	35	16.55
JULY.															
Mon.	14	7	31	12.00	10.148	N.	21	47	43.1	22.05	5	31.86	0.292	7	25	40.14
AUGUST.															
Sat.	9	9	13	37.42	9.530	N.	16	03	51.1	42.81	5	26.85	0.323	9	08	10.57
SEPTEMBER.															
Thur.	18	11	40	16.06	8.968	N.	2	08	10.7	58.06	5	36.63	0.887	11	45	52.69
Tues.	23	11	58	12.88	8.983	N.	0	11	36.7	58.45	7	22.57	0.873	12	05	35.45
OCTOBER.															
Mon.	20	13	37	01.71	9.411	S.	10	56	16 2	54.11	15	00.65	0.445	13	52	02.36
NOVEMBER.															
Thur.	27	16	09	21.11	10.664	S.	21	00	57.8	28.66	12	30.32	0.807	16	21	51.43
DECEMBER.															
Wed.	3	16	35	09.30	10.832	S.	22	01	01.7	21.91	10	21.47	0.976	16	45	30.77
Sat.	6	16	48	11.86	10.903		22	25	23.9	18.68	9	08.58	1.046	16	57	20.44
Sat.	20	17	49	53.98	11.096	S.	23	25	45.2	2.67	2	38.26	1.239	17	52	32.24

GREENWICH MEAN TIME.

Day of the Month.	THE MOON'S											
	SEMI-DIAMETER.				HORIZONTAL PARALLAX.				UPPER TRANSIT.		AGE.	
	Noon.		Midnight		Noon.	Diff. for 1 Hour.	Midnight.	Diff. for 1 Hour.	Meridian of Greenwich.	Diff. for 1 Hour.	Noon.	
	′	″	′	″	′	″	″	′ ″	″	h m	m	d
AUGUST.												
15	14	51.2	14	53.5	54	25.0	0.63	54 33.4	0.77	9 23.7	1.99	11.7
NOVEMBER.												
20	16	14.9	16	09.0	59	31.9	1.73	59 10.4	1.82	17 01.5	2.23	20.2

GREENWICH MEAN TIME.

THE MOON'S RIGHT ASCENSION AND DECLINATION.

Hour	Right Ascension	Diff. for 1 Minute	Declination	Diff. for 1 Minute
AUGUST 15.				
14	19 06 41.28	2.0917	S. 17 35 09.4	3.996
NOVEMBER 20.				
12	8 46 54.40	2.3392	N. 12 44 23.4	8.532

Mean Places for the Fixed Stars

FOR THE BEGINNING OF 1902.

Name of Star.	Magnitude.	Right Ascension.	Annual Variation.	Declination.	Annual Variation.
		h m s	s	° ′ ″	″
α Ursæ Min. (*Polaris*)	2	1 23 24.04	+25.628	+ 88 47 04.1	+ 18.74
α Arietis	2	2 01 38.80	+ 3.373	+ 22 59 57.1	+ 17.14
α Tauri (*Aldebaran*)	1	4 30 17.77	+ 3.439	+ 16 18 45.0	+ 7.46
β Orionis (*Rigel*)	1	5 09 49.66	+ 2.882	− 8 18 52.7	+ 4.35
α^2 Geminorum (*Castor*)	2	7 28 20.89	+ 3.835	+ 32 06 13.9	− 7.62
α Canis Minoris (*Procyon*)	1	7 34 10.34	+ 3.143	+ 5 28 34.5	− 9.04

TABLE FOR REDUCING SIDEREAL TO MEAN TIME AND VICE VERSA.

MEAN SOLAR INTO SIDEREAL TIME. To be added to a Mean Time interval.						SIDEREAL INTO MEAN SOLAR TIME. To be subtracted from a Sidereal Time interval.					
h.	m.	s.	m.	s.	s.	h.	m.	s.	m.	s.	s.
1	0	9.856	1	0.164	0.003	1	0	9.830	1	0.164	0.003
2	0	19.713	2	0.329	0.005	2	0	19.659	2	0.328	0.005
3	0	29.569	3	0.493	0.008	3	0	29.489	3	0.491	0.008
4	0	39.426	4	0.657	0.011	4	0	39.318	4	0.655	0.011
5	0	49.282	5	0.821	0.014	5	0	49.148	5	0.819	0.014
6	0	59.139	6	0.986	0.016	6	0	58.977	6	0.983	0.016
7	1	08.995	7	1.150	0.019	7	1	08.807	7	1.147	0.019
8	1	18.852	8	1.314	0.022	8	1	18.636	8	1.311	0.022
9	1	28.708	9	1.478	0.025	9	1	28.466	9	1.474	0.025
10	1	38.565	10	1.643	0.027	10	1	38.296	10	1.638	0.027
11	1	48.421	11	1.807	0.030	11	1	48.125	11	1.802	0.030
12	1	58.278	12	1.971	0.033	12	1	57 955	12	1.966	0.033
13	2	08.134	13	2.136	0.036	13	2	07.784	13	2.130	0.035
14	2	17.991	14	2.300	0.038	14	2	17.614	14	2.294	0.038
15	2	27.847	15	2.464	0.041	15	2	27.443	15	2.457	0.041
16	2	37.704	16	2.628	0.044	16	2	37.273	16	2.621	0.044
17	2	47.560	17	2.793	0.047	17	2	47.102	17	2.785	0.046
18	2	57.417	18	2.957	0.049	18	2	56.932	18	2.949	0.049
19	3	07.273	19	3.121	0.052	19	3	06.762	19	3.113	0.052
20	3	17.129	20	3.285	0.055	20	3	16.591	20	3.277	0.055
21	3	26.986	21	3.450	0.057	21	3	26.421	21	3.440	0.057
22	3	36.842	22	3.614	0.060	22	3	36.250	22	3.604	0.060
23	3	46.699	23	3.778	0.063	23	3	46.080	23	3.768	0.063
24	3	56.555	24	3.943	0.066	24	3	55.910	24	3.932	0.066
			25	4.107	0.068				25	4.096	0.068
			26	4.271	0.071				26	4.259	0.071
			27	4.435	0.074				27	4.423	0.074
			28	4.600	0.077				28	4.587	0.076
			29	4.764	0.079				29	4.751	0.079
			30	4.928	0.082				30	4.915	0.082
			31	5.093	0.085				31	5.079	0.085
			32	5.257	0 088				32	5.242	0.087
			33	5.421	0.090				33	5.405	0.090
			34	5.585	0.093				34	5.570	0.093
			35	5.750	0.096				35	5.734	0.096
			36	5.914	0.099				36	5.898	0.098
			37	6.078	0.101				37	6.062	0.101
			38	6.242	0.104				38	6.225	0.104
			39	6.407	0.107				39	6.389	0.106
			40	6.571	0.110				40	6.553	0.109
			41	6.735	0.112				41	6.717	0.112
			42	6.900	0.115				42	6.881	0.115
			43	7.064	0.118				43	7.045	0.117
			44	7.228	0.120				44	7.208	0.120
			45	7.392	0.123				45	7.372	0.123
			46	7.557	0.126				46	7.536	0.126
			47	7.721	0.129				47	7.700	0.128
			48	7.885	0.131				48	7.864	0.131
			49	8.049	0.134				49	8.027	0.134
			50	8.214	0.137				50	8.191	0.137
			51	8.378	0.140				51	8.355	0.139
			52	8.542	0.142				52	8.519	0.142
			53	8.707	0.145				53	8.683	0 145
			54	8.871	0.148				54	8.847	0.147
			55	9.035	0.151				55	9.010	0.150
			56	9.199	0.153				56	9.174	0.153
			57	9.364	0.156				57	9 338	0.156
			58	9.528	0.159				58	9.502	0.158
			59	9.692	0.162				59	9.666	0.161
			60	9.857	0.165				60	9.830	0.164

"NEW JERSEY"

Mixed Marine Paints

being QUICK DRYING, are desirable for vessels; for what can be more annoying about a vessel than to have paint applied that is slow drying?

"NEW JERSEY"

No. 1

Anti-Corrosive Paint

No. 2

Anti-Fouling Paint

First Coat.

For Iron and Steel Vessels

1

"New Jersey"

Anti-Corrosive Paint

Finishing Coat.

For Iron and Steel Vessels

2

"New Jersey"

Anti-Fouling Paint

Protecting Vessels from Barnacles and Grass.

To be applied as a Finishing Coat on bottoms of Steel and Iron Vessels.

Weight of Various Substances.

The following table contains the weight per cubic foot of several substances which may enter into a ship as cargo, ballast or part of the structure and will facilitate the calculation of weights and magnitudes.

To find the weight of any quantity of any particular substance, find the number of cubic feet or inches it contains and multiply that quantity by the number found in the table corresponding to the material in question, and the product will be the weight in pounds.

If the weight is known and the volume is wanted, divide the whole weight by the weight per cubic foot and the result will be the volume.

On account of the variations of the weight per cubic foot of different specimens of the same substances, the results obtained by using the tabulated number cannot be looked upon as exactly correct. However, they are sufficiently so for the purposes intended, as indicated by the following examples.

The table of areas of circles will be found useful in determining the weight or volume of circular bodies.

The following problems illustrate the use of the tables:

Example: Find the weight of a steel shaft 16 feet long and 15 inches diameter. It will be noticed that the length of this shaft is given in feet and the diameter in inches. The area for 15 inches may be taken from the table and multiplied by the length in inches, or the area for 15 inches may be divided by 144 (the number of inches in a square foot), which will give the area in feet, and is then multiplied by the length in feet.

Area 15 inches	=	176.7146
Length 16 feet in inches	=	× 192
		3534292
		15904314
		1767146
Cubic inches in shaft	=	33929.2032

and is reduced to cubic feet by dividing it by 1728 (the number of cubic inches in one cubic foot).

```
1728)33929.20(19.63 = cubic feet
  1728
 16649
 15552
 10972
 10368
  6040
  5184
   856
```

Cubic feet in shaft	=	19.63
Weight in pounds of one cubic foot of steel	=	× 489
		17667
		15704
		7852
Weight of shaft in pounds	=	9599.07

and is reduced to tons by dividing it by 2240 (the number of pounds in a long ton).

```
2240)9599.07(4.28
  8960
  6390
  4480
 19107
 17920
  1187
```

Weight of shaft = 4.28 tons.

Example: A cylindrical tank 5 feet in diameter and 9 feet high is filled with fresh water. Find the weight and number of gallons it contains.

Area 5 feet	=	19.635
Altitude of tank	=	× 9
Cubic feet in tank	=	176.715
Gallons in one cubic foot	=	× 7.48
		1413720
		706860
		1237005
Gallons in tank	=	1321.82820

Cubic feet in tank	=	176.715
Weight of one cubic foot water	=	× 62.425
		883575
		353430
		706860
		353430
		1060290
Weight of water in pounds	=	11031.433875

and is reduced to tons by dividing by 2240.

```
2240)11031.434(4.924 = tons
  8960
  20714
  20160
   5543
   4480
  10634
   8960
   1674
```

The weight can be obtained by dividing the cubic feet by 35.88 (the number of cubic feet in one ton of water) and is more convenient.

Example: A mahogany log measures 23x4x3½ feet. Find its weight in tons.

Length in feet	=	23
Breadth in feet	=	× 4
		92
Depth in feet		× 3.5
		460
		276
Cubic feet in log	=	322.0
Weight of one cubic foot =		× 53
		966
		1600
Weight of log 7.57 tons	=	16966 (pounds)

Example: Find the weight of a cast iron pipe of the following dimensions. Inside diameter, 5 feet. Outside diameter, 5 feet 2 inches. Length, 12 feet.

Outside diameter, 5 feet 2 inches = 62 inches area	=	3019.07
Inside " 5 " 0 " = 60 " "	=	2827.43
Circum. mean diameter. 62 inches	=	191.64
Length of pipe, 12 feet = 144 inches	=	× 144
		76656
		76656
		19164
Cubic inches of material	=	27596.16

and is reduced to cubic feet by dividing by 1728 (the number of cubic inches in one cubic foot).

```
1728)27596.16(15.97 cubic feet.
  1728
  10316
   8640
  16761
  15552
  12096
  12096
```

Cubic feet of iron in pipe	=	15.97
Weight of one cubic foot of cast iron in pounds	=	× 450
		79850
		6388
Weight of pipe in pounds	=	7186.50

Example: A block of granite is 3 feet long, 3 feet wide and 2 feet thick. Find its weight

18 cubic feet = 3×3×2		
Weight of one cubic foot in pounds	=	169
Cubic feet in block	=	× 18
		1352
		169
Weight of block in pounds	=	3042

Example: A bunker measures 25 feet in length, 15 feet in width and 14 feet in depth. How many tons of soft coal will it hold? Taking the weight of one cubic foot of bituminous coal from the table and dividing 2240 by it, will give the number of cubic feet in one ton. In using the weight given in the table, some judgment must be exercised as it is somewhat above the mean value, as some coal will measure 35 cubic feet to the ton, while other grades may go beyond 47 cubic feet. The number in the table is for a grade of coal measuring 43 cubic feet to the ton.

$$\text{Capacity of bunker in tons} = 122.09 = \frac{25\times15\times14}{43}$$

If desired, logarithms may be introduced to shorten calculations of this nature.

Length 25 feet	= log.	1.39794
Width 15 "	= "	1.17609
Depth 14 "	= "	1.14613
Capacity 525 cubic feet	= "	3.72016
Cubic feet in one ton, 43	= "	1.63347
Bunker capacity, 122.09 tons	= "	2.08669

"WETTERSTEDT'S"

COPPER PAINT

THE FIRST COPPER PAINT MANUFACTURED IN THIS COUNTRY

PATENTED IN ENGLAND, 1846. FRANCE, 1847.
UNITED STATES, AUGUST 5, 1851

FINELY GROUND

EASY TO APPLY

This Paint was formerly manufactured by R. F. Seaman with other brands of Marine Paints, and having purchased his business, trade-marks, etc., it is now manufactured by

HARRY LOUDERBOUGH, Proprietor,

NEW JERSEY PAINT WORKS

JERSEY CITY, N. J., U. S. A.

Table of Weight of Various Substances.

Name of Substance	Weight in Pounds per Cubic Foot	Name of Substance	Weight in Pounds per Cubic Foot
Aluminum	156	Magnesia	46
Ambergris	58	Mahogany	53
Ash (wood)	47	Manganese	500
Beech	43	Marble, common	168
Beeswax	60	" Italian	169
Bronze, gun metal	543	" Parian	177
Brick	119	" Vermont	177
Brass	488	Oak, live	60
Cedar	37	" white	49
Chalk	174	Olive oil	57
Charcoal	28	Palm oil	49
Clay	120	Petroleum, crude	56
Coal, anthracite avg	55	" refined	50
" bituminous, "	52	Pine, white	25
Coke	30	" yellow	44
Copper	549	Pitch	72
Coral	167	Plaster of Paris	154
Cork	15	Rosin	70
Cryolite	184	Salt, common	133
Cypress	37	Saltpeter	130
Earth, loose	94	Sand	165
Elm	35	Slate	167
Emery	250	Spruce	34
Glass	183	Steel	489
Granite	169	Stone, common	157
Grindstone	134	" pumice	57
Gypsum, opaque	135	Sugar	100
Hackmatack	37	Sulphur	127
Hemlock, dry	27	Tallow	59
Ice	57	Tar, pine	61
Iron, cast	450	Teakwood	47
" wrought	486	Tin	456
Lard	59	Turpentine	54
Lead	707	Water, fresh, 39.2 F	62.425
Lignum-vitæ	83	" New York Harbor	63
Lime, quick	76	" sea, avg	64
Limestone	185	Whale oil	58
Linseed oil	59	Wine	62
Logwood	57	Zinc	449

Fresh Water.

UNITED STATES GALLON.

$$\text{Tons} = \frac{\text{gallons}}{268.365} \qquad \text{Tons} = \frac{\text{cubic feet}}{35.883}$$

Pounds = cubic feet × 62.425
Gallons = cubic feet × 7.48
Pressure = height in feet × .4335
Height in feet = pressure × 2.3093

			Logarithm.
1 ton	contains	35.883 cubic feet	1.55489
1 "	"	268.365 gallons	2.56628
1 "	weighs	2240 pounds	3.35025
1 gallon	contains	231 cubic inches	2.36361
1 "	"	.833 imperial gallon	2.92065
1 "	weighs	8.33 pounds	.92065
1 quart	"	2.08 "	.31806
1 pint	"	1.04 "	.01703
1 gill	"	.26 "	9.41497
1 cubic foot	"	62.425 "	1.79536
1 " "	contains	7.48 gallons	.87390
1 " "	"	1728 cubic inches	3.23754
1 " inch	weighs	.036125 pounds	8.55781
12 " inches	"	.4335 "	9.63699
27.71 cubic "	"	1 "	
27.71 " "	height	2.3093 feet	.36348

IMPERIAL GALLON.

1 ton	contains	223.55 gallons	1.34938
1 gallon	"	277.274 cubic inches	2.44291
1 "	"	1.2 U. S. gallons	.07918
1 "	weighs	10.016 pounds	1.00069
1 cubic foot	contains	6.23 gallons	.79449

Metric System.

METRIC CONVERSION TABLE.

LINEAR MEASURE.

DENOMINATION	ABBR.	VALUE
Myriameter	.....	10000 meters
Kilometer	km.	1000 "
Hectometer	.....	100 "
Dekameter	.....	10 "
Meter	m.	1 "
Decimeter	dm.	.1 "
Centimeter	cm.	.01 "
Millimeter	mm.	.001 "

MEASURE OF VOLUME.

DENOMINATION	ABBR.	VALUE
Kiloliter	.....	1000 liters
Stere	s.	" "
Cubic Meter	$m.^3$	" "
Hectoliter	hl.	100 "
Dekaliter	dal	10 "
Cubic Decimeter	$dm.^3$	1 "
Liter	l.	1 "
Deciliter	dl.	.1 "
Centiliter	cl.	.01 "
Cubic Centimeter	$cm.^3$	.001
Milliliter	ml.	.001 liter
Cubic Millimeter	$mm.^3$	.000001 "
Microliter	λ	.001 m. l.

MEASURE OF SURFACE.

DENOMINATION	ABBR.	VALUE
Sq. Kilometer	$km.^2$	1000000 $m.^2$
Hektar	ha.	10000 $m.^2$
Are	a	100 $m.^2$
Centare	.....	1 $m.^2$
Square Meter	$m.^2$	1 $m.^2$
Sq. Decimeter	$dm.^2$	.01 $m.^2$
Sq. Centimeter	$m.^2$	0001 $m.^2$
Sq. Millimeter	$mm.^2$	.000001 $m.^2$

MEASURE OF MASS.

DENOMINATION	ABBR.	VALUE
Millier	.....	1000 kilos
Tonneau	.....	" "
Metric Ton	t.	" "
Quintal	.....	100 "
Myriagram	.....	10 "
Kilogram	kg.	1000 grams
Kilo	.....	" "
Hectogram	.....	100 "
Dekagram	.....	10 "
Gram	g.	1 "
Decigram	dg.	.1 "
Centigram	cg.	.01 "
Milligram	mg	.001 "
Microgram	y.	.001 m. g.

Millimeters	×	.03937	=	inches.
"	÷	25.4	=	"
Centimeters	×	.3937	=	"
"	÷	2.54	=	"
Meters	×	39.37	=	" (Act of Congress.)
"	×	3.281	=	feet.
"	×	1.094	=	yards.
Kilometers	×	.621	=	miles.
"	÷	1.6093	=	"
"	×	3280.7	=	feet.
Square Millimeters	×	.00155	=	square inches.
" "	÷	645.1	=	" "
Square Centimeters	×	.155	=	" "
" "	÷	6.451	=	" "
Square Meters	×	10.764	=	" feet.
Square Kilometers	×	247.1	=	acres.
Hektares	×	2.471	=	acres.
Cubic Centimeters	÷	16.383	=	cubic inches.
" "	÷	3.69	=	fluid drachms.
" "	÷	29.57	=	fluid ounce.
" Meters	×	35.315	=	cubic feet.
" "	×	1.308	=	cubic yards.
" "	×	264.2	=	gallons (231 cu. in.).
Liters	×	61.022	=	cubic inches (Act of Congress).
"	×	33.84	=	fluid ounce (U. S. Phar.).
"	×	.2642	=	gallons (231 cu. in.).
"	÷	3.78	=	" " "
"	÷	28.316	=	cubic feet.
Hectoliters	×	3.531	=	" "
"	×	2.84	=	bushels (2150.42 cu. in.).
"	×	.131	=	cubic yards.
"	×	26.42	=	gallons (231 cu. in.).
Grams	×	15.432	=	grains (Act of Congress).
"	×	981	=	dynes.
" (water)	÷	29.57	=	fluid ounces.
"	÷	28.35	=	ounces avoirdupois.
" per cu. cent.	÷	27.7	=	pounds per cubic inches.
Joule	×	.7373	=	foot-pounds.
Kilograms	×	2.2046	=	pounds.
"	×	35.3	=	ounce, avoirdupois.
"	÷	907.2	=	tons (2000 lbs.).
" per sq. cent.	×	14.223	=	pounds per sq. in.
Kilogrammeters	×	7.233	=	foot-pounds.
Kilograms per lineal meter	×	.672	=	pounds per lineal foot.
" " square "	×	.205	=	pounds per square foot.
" " cubic "	×	.062	=	pounds per cubic foot.
" " cheval-vapeur	×	2.235	=	pounds per H. P.
Kilo-watts	×	1.34	=	horse-power.
Watts	÷	746	=	"
"	×	.7373	=	foot-pounds per second.
Calorie	×	3.968	=	B. T. U.
Cheval-vapeur	×	.9863	=	horse-power.
(Deg. Centigrade	×	1.8) + 32	=	degrees Fahrenheit.
Francs	×	.193	=	dollars.
Gravity, Paris	=	980.94		centimeters per second.
1 Admiralty knot	=	1.853		kilometers.

1 Atmosphere is the pressure of a column of 76 centimeters of mercury at the temperature of melting ice at Paris, where it is equal to 1.0333 kilos on a square centimeter.

Length of Circular Arcs.

°	Length.	°	Length.	′	Length.	′	Length.
1	.01745329	10	.17453293	1	.00029089	10	.00290888
2	.03490659	20	.34906585	2	.00058078	15	.00436332
3	.05235988	30	.52359878	3	.00087266	20	.00581776
4	.06981317	40	.69813170	4	.00116455	30	.00872665
5	.08726646	50	.87266463	5	.00145444	40	.01163553
6	.10471976	60	1.04719755	6	.00174533	45	.01308997
7	.12217305	70	1.22173048	7	.00203622	50	.01454441
8	.13962634	80	1.39626340	8	.00232711	55	.01599885
9	.15707963	90	1.57079633	9	.00261799	1°	.01745329

The above table contains the length of the degree and minute of arc, the radius of the circle being one, and when the radius is different, multiply the corresponding number by it.

Example: Find the length of 37° 42′, the radius being 9 inches.

30°	=	.52359878
7°	=	.12217305
40′	=	.01163553
2′	=	.00058078
		.65798814
Radius	=	× 9
Length of 37° 42′	=	5.92189326

Example: Find the length of 23° 30′, the radius 22 feet.

20°	=	.34906585
3°	=	.05235988
30′	=	.00872665
		.41015238
		22
		82030476
		82030476
		9.02335236

The same result may be obtained by dividing the circumference by 360° and multiplying the quotient by the degrees and decimal parts of a degree, and is written:

$$9.02335 + = \frac{138.2301}{360} \times 23°.5$$

The Art of Mildew Proofing.

It is claimed that after a number of years of patient experimenting a process for mildew proofing canvas goods of all descriptions has been evolved which meets the requirements. In devising this process three important things had to be considered, namely, something which would prevent mildew, which would not injure the fibre of the canvas and which would not harden or stiffen it. The process obtained not only was found to prevent mildew for one year, but for an indefinite period. From the very nature of the material used, instead of taking away the strength of the canvas, it was found to have strengthened it considerably, as was shown by tests. The canvas was not hardened, but rather softened and made more pliable. Furthermore, it was found that after a rain the sail could be easily handled, not having been stiffened, as is usually the case in untreated sails. It was also found that it dried faster than would untreated sails. No effect as to color is noticeable, except that canvas when treated is greatly whitened. The set of the sail or awning is not injured, neither is the roping affected. Further claims are that no more mildew can enter the canvas after being treated by this cleaning process. A water proofing process has also been invented which is said to be mildew proof. The advantages claimed of this work are that it does not turn black, as does parafined canvas—is not hard and stiff and dries quickly. Something that every yachtsman and mariner should investigate.

Fractions of an Inch in Decimals.

Fraction of an Inch.	Decimal of an Inch.	Fraction of an Inch.	Decimal of an Inch.	Fraction of an Inch.	Decimal of an Inch.	Fraction of an Inch.	Decimal of an Inch.
1-64	.01562	17-64	.26562	33-64	.51562	49-64	.76562
1-32	.03125	9-32	.28125	17-32	.53125	25-32	.78125
3-64	.04687	19-64	.29687	35-64	.54687	51-64	.79687
1-16	.06250	5-16	.31250	9-16	.56250	13-16	.81250
5-64	.07812	21-64	.32812	37-64	.57812	53-64	.82812
3-32	.09375	11-32	.34375	19-32	.59375	27-32	.84375
7-64	.10937	23-64	.35937	39-64	.60937	55-64	.85937
1-8	.12500	3-8	.37500	5-8	.62500	7-8	.87500
9-64	.14062	25-64	.39062	41-64	.64062	57-64	.89062
5-32	.15625	13-32	.40625	21-32	.65625	29-32	.90625
11-64	.17187	27-64	.42187	43-64	.67187	59-64	.92187
3-16	.18750	7-16	.43750	11-16	.68750	15-16	.93750
13-64	.20312	29-64	.45312	45-64	.70312	61-64	.95312
7-32	.21875	15-32	.46875	23-32	.71875	31-32	.96875
15-64	.23437	31-64	.48437	47-64	.73437	63-64	.98437
1-4	.25000	1-2	.50000	3-4	.75000	1 inch	1.00000

Areas and Circumferences of Circles.

Diameter.	Area.	Circumference.	Diameter.	Area.	Circumference.
1	.7854	3.1416	51	2042.8206	160.2212
2	3.1416	6.2832	52	2123.7166	163.3628
3	7.0686	9.4248	53	2206.1834	166.5044
4	12.5664	12.5664	54	2290.2210	169.6460
5	19.6350	15.7080	55	2375.8294	172.7876
6	28.2743	18.8496	56	2463.0086	175.9292
7	38.4845	21.9911	57	2551.7586	179.0708
8	50.2655	25.1327	58	2642.0794	182.2184
9	63.6173	28.2743	59	2733.9710	185.3540
10	78.5398	31.4159	60	2827.4334	188.4956
11	95.0332	34.5575	61	2922.4666	191.6372
12	113.0973	37.6991	62	3019.0705	194.7787
13	132.7323	40.8407	63	3117.2453	197.9203
14	153.9380	43.9823	64	3216.9909	201.0619
15	176.7146	47.1239	65	3318.3072	204.2035
16	201.0619	50.2655	66	3421.1944	207.3451
17	226.9801	53.4071	67	3525.6524	210.4867
18	254.4690	56.5487	68	3631.6811	213.6283
19	283.5287	59.6903	69	3739.2807	216.7699
20	314.1593	62.8319	70	3848.4510	219.9115
21	346.3606	65.9734	71	3959.1921	223.0531
22	380.1327	69.1150	72	4071.5041	226.1947
23	415.4756	72.2566	73	4185.3868	229.3363
24	452.3893	75.3982	74	4300.8403	232.4779
25	490.8739	78.5398	75	4417.8647	235.6194
26	530.9292	81.6814	76	4536.4598	238.7610
27	572.5553	84.8230	77	4656.6257	241.9026
28	615.7522	87.9646	78	4778.3624	245.0442
29	660.5199	91.1062	79	4901.6699	248.1858
30	706.8583	94.2478	80	5026.5482	251.3274
31	754.7676	97.3894	81	5152.9974	254.4690
32	804.2477	100.5310	82	5281.0173	257.6106
33	855.2986	103.6726	83	5410.6079	260.7522
34	907.9203	106.8142	84	5541.7694	263.8938
35	962.1128	109.9557	85	5674.5017	267.0354
36	1017.8760	113.0973	86	5808.8048	270.1770
37	1075.2101	116.2389	87	5944.6787	273.3186
38	1134.1149	119.3805	88	6082.1234	276.4602
39	1194.5906	122.5221	89	6221.1389	279.6017
40	1256.6371	125.6637	90	6361.7251	282.7434
41	1320.2543	128.8053	91	6503.8822	285.8849
42	1385.4424	131.9469	92	6647.6101	289.0265
43	1452.2012	135.0835	93	6792.9097	292.1681
44	1520.5308	138.2301	94	6939.7782	295.3097
45	1590.4313	141.3717	95	7088.2184	298.4513
46	1661.9025	144.5133	96	7238.2295	301.5929
47	1734.9445	147.6549	97	7389.8113	304.7345
48	1809.5574	150.7964	98	7542.9640	307.8761
49	1885.7410	153.9380	99	7697.6874	311.0177
50	1963.4954	157.0796	100	7853.9816	314.1593

Inches and Fractions in Decimals of a Foot.

Parts of Foot in inches and Fractions.	Decimal of a Foot.	Parts of Foot in inches and Fractions.	Decimal of a Foot.	Parts of Foot in inches and Fractions.	Decimal of a Foot.	Parts of Foot in inches and Fractions.	Decimal of a Foot.
1-16	.00520	3 1-16	.25520	6 1-16	.50520	9 1-16	.75520
1-8	.01040	3 1-8	.26040	6 1-8	.51040	9 1-8	.76040
3-16	.01562	3 3-16	.26562	6 3-16	.51562	9 3-16	.76562
1-4	.02080	3 1-4	.27080	6 1-4	.52080	9 1-4	.77080
5-16	.02600	3 5-16	.27600	6 5-16	.52600	9 5-16	.77600
3-8	.03125	3 3-8	.28125	6 3-8	.53125	9 3-8	.78125
7-16	.03640	3 7-16	.28650	6 7-16	.53640	9 7-16	.78650
1-2	.04170	3 1-2	.29170	6 1-2	.54170	9 1-2	.79170
9-16	.04687	3 9-16	.29687	6 9-16	.54687	9 9-16	.79687
5-8	.05210	3 5-8	.30210	6 5-8	.55210	9 5-8	.80210
11-16	.05730	3 11-16	.30730	6 11-16	.55730	9 11-16	.80730
3-4	.06250	3 3-4	.31250	6 3-4	.56250	9 3-4	.81250
13-16	.06770	3 13-16	.31770	6 13-16	.56770	9 13-16	.81770
7-8	.07290	3 7-8	.32290	6 7-8	.57290	9 7-8	.82290
15-16	.07812	3 15-16	.32812	6 15-16	.57812	9 15-16	.82812
1 inch	.08330	4 inches	.33330	7 inches	.58330	10 inches	.83330
1 1-16	.08850	4 1-16	.33850	7 1-16	.58850	10 1-16	.83850
1 1-8	.09375	4 1-8	.34375	7 1-8	.59375	10 1-8	.84375
1 3-16	.09900	4 3-16	.34900	7 3-16	.59900	10 3-16	.84900
1 1-4	.10420	4 1-4	.35420	7 1-4	.60420	10 1-4	.85420
1 5-16	.10937	4 5-16	.35937	7 5-16	.60937	10 5-16	.85937
1 3-8	.11460	4 3-8	.36460	7 3-8	.61460	10 3-8	.86460
1 7-16	.11980	4 7-16	.36980	7 7-16	.61980	10 7-16	.86980
1 1-2	.12500	4 1-2	.37500	7 1-2	.62500	10 1-2	.87500
1 9-16	.13020	4 9-16	.38020	7 9-16	.63020	10 9-16	.88020
1 5-8	.13540	4 5-8	.38540	7 5-8	.63540	10 5-8	.88540
1 11-16	.14062	4 11-16	.39062	7 11-16	.64062	10 11-16	.89062
1 3-4	.14580	4 3-4	.39580	7 3-4	.64580	10 3-4	.89580
1 13-16	.15100	4 13-16	.40100	7 13-16	.65100	10 13-16	.90100
1 7-8	.15625	4 7-8	.40625	7 7-8	.65625	10 7-8	.90625
1 15-16	.16150	4 15-16	.41140	7 15-16	.66150	10 15-16	.91150
2 inches	.16670	5 inches	.41670	8 inches	.66670	11 inches	.91670
2 1-16	.17187	5 1-16	.42187	8 1-16	.67187	11 1-16	.92187
2 1-8	.17710	5 1-8	.42710	8 1-8	.67710	11 1-8	.92710
2 3-16	.18230	5 3-16	.43230	8 3-16	.68230	11 3-16	.93230
2 1-4	.18750	5 1-4	.43750	8 1-4	.68750	11 1-4	.93750
2 5-16	.19270	5 5-16	.44270	8 5-16	.69270	11 5-16	.94270
2 3-8	.19790	5 3-8	.44790	8 3-8	.69790	11 8-8	.94790
2 7-16	.20312	5 7-16	.45312	8 7-16	.70312	11 7-16	.95312
2 1-2	.20830	5 1-2	.45830	8 1-2	.70830	11 1-2	.95830
2 9-16	.21350	5 9-16	.46350	8 9-16	.71350	11 9-16	.96350
2 5-8	.21875	5 5-8	.46875	8 5-8	.71875	11 5-8	.96875
2 11-16	.22400	5 11-16	.47400	8 11-16	.72400	11 11-16	.97400
2 3-4	.22920	5 3-4	.47920	8 3-4	.72920	11 3-4	.97920
2 13-16	.23437	5 13-16	.48437	8 13-16	.73437	11 13-16	.98437
2 7-8	.23950	5 7-8	.48960	8 7-8	.73960	11 7-8	.98960
2 15-16	.24480	5 15-16	.49480	8 15-16	.74480	11 15-16	.99480
3 inches	.25000	6 inches	.50000	9 inches	.75000	12 inches	1.00000

The National Flag.

The official flag of the United States bears forty-five stars in a blue field, arranged in six rows —the first, third, and fifth rows having eight stars each, and the others having seven stars each. The garrison flag of the Army is made of bunting, thirty-six fly and twenty feet hoist; thirteen stripes, and in the upper quarter, next the staff, is the field or "union" of stars, equal to the number of States, on blue field, over one-third length of the flag, extending to the lower edge of the fourth red stripe from the top. The storm flag is twenty feet by ten feet and the recruiting flag is nine feet nine inches by four feet four inches. The "American Jack" is the "union" or blue field of the flag. The Revenue Marine Service flag, authorized by act of Congress, March 2, 1799, was originally prescribed to "consist of sixteen perpendicular stripes, alternate red and white, the union of the ensign bearing the arms of the United States in dark blue on a white field." The sixteen stripes represented the number of States which had been admitted to the Union at that time, and no change has been made since. Prior to 1871 it bore an eagle in the union of the pennant, which was then substituted by thirteen blue stars in a white field, but the eagle and stars are still retained in the flag. June 14, the anniversary of the adoption of the National flag, is celebrated as Flag Day in the public schools, and by the display of the emblem on public buildings and private houses in a large part of the Union.

TABLE FOR FINDING THE DISTANCE OFF A VESSEL WILL PASS ANY LIGHT.

Distance visible in nautical miles	POINTS ON THE BOW												
	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7
1	0.1	0 2	0.3	0.4	0 5	0 6	0.6	0 7	0 8	0.8	0.9	0 9	1.0	1.0
2	0.2	0.4	0.6	0.8	0.9	1.1	1.3	1.4	1 5	1.7	1 8	1.8	1.9	2.0
3	0 3	0.6	0.9	1.1	1.4	1.7	1.9	2.1	2 3	2.5	2.6	2.8	2.9	2.9
4	0.4	0 8	1.2	1.5	1.9	2 2	2.5	2.8	3.1	3.3	3.5	3.7	3.8	3.9
5	0.5	1 0	1.5	1.9	2 4	2.8	3.2	3 5	3.9	4.2	4.4	4.6	4.8	4 9
6	0 6	1 2	1 7	2.3	2 8	3.8	3.8	4.2	4.6	5 0	5.3	5.5	5.7	5.9
7	0.7	1.4	2.0	2.7	3.3	3.9	4.4	4.9	5.4	5 8	6.2	6.5	6.7	6 9
8	0.8	1 6	2 3	3.1	3.8	4.4	5.1	5 7	6.2	6 7	7.1	7.4	7.7	7.8
9	0 9	1.8	2 6	3 4	4.2	5.0	5.7	6.4	7.0	7 5	7.9	8.3	8.6	8.8
10	1.0	2.0	2 9	3.8	4.7	5.6	6.3	7.1	7.7	8 3	8.8	9.2	9.6	9.8
11	1.1	2.1	3.2	4 2	5.2	6.1	7.0	7.8	8.5	9.1	9 7	10.2	10.5	10.8
12	1 2	2.3	3.5	4 6	5.7	6.7	7.6	8.5	9 3	10.0	10 6	11.1	11.5	11.8
13	1.3	2.5	3.8	5.0	6.1	7 2	8.2	9.2	10.0	10.8	11.5	12.0	12.4	12.8
14	1.4	2.7	4 1	5.4	6.6	7.8	8.9	9.9	10.8	11 6	12.3	12.9	13.4	13.7
15	1 5	2 9	4.4	5 7	7.1	8.3	9.5	10 6	11.6	12.5	13.2	13.9	14.4	14.7
16	1.6	3.1	4 6	6.1	7.5	8 9	10 2	11 3	12.4	13.3	14.1	14.8	15.3	15.7
17	1.7	3.3	4.9	6 5	8.0	9.4	10 8	12 0	13.1	14.1	15.0	15.7	16.3	16.7
18	1.8	3 5	5.2	6 9	8.5	10.0	11.4	12.7	13.9	15.0	15.9	16.6	17.2	17.7
19	1 9	3 7	5.5	7.3	9.0	10.6	12.1	13.4	14 7	15.8	16.8	17.6	18.2	18 6
20	2.0	3.9	5 8	7 7	9.4	11.1	12 7	14.1	15.5	16.6	17.6	18.5	19.1	19 6
21	2.1	4.1	6 1	8.0	9.9	11 7	13.3	14 8	16.2	17.5	18.5	19.4	20.1	20.6
22	2 2	4.3	6 4	8.4	10.4	12 2	14.0	15.6	17.0	18.3	19.4	20.3	21.1	21.6
23	2.3	4.5	6.7	8 8	10.8	12.8	14.6	16.3	17.8	19.1	20.3	21.2	22.0	22.6
24	2.4	4.7	7.0	9 2	11.3	13.3	15.2	17.0	18.6	20.0	21.2	22.2	23.0	23.5
25	2.5	4.9	7.3	9 6	11 8	13.9	15.9	17 7	19 3	20 8	22.0	23.1	23.9	24.5
26	2 5	5.1	7.5	9.9	12.3	14 4	16 5	18.4	20.1	21.6	22 9	24.0	24.9	25.5
27	2.6	5 3	7.8	10.3	12 7	15.0	17.1	19.1	20.9	22.4	23.8	24.9	25.8	26.5
28	2.7	5.5	8.1	10 7	13.2	15.6	17.8	19.8	21.6	23.3	24.7	25.9	26 8	27.5
29	2 8	5.7	8.4	11.1	13 7	16.1	18.4	20.5	22.4	24.1	25 6	26.8	27.8	28 4
30	2.9	5.9	8 7	11 5	14.1	16.7	19.0	21.2	23.2	24.9	26.5	27.7	28.7	29.4
31	3.0	6.0	9.0	11.9	14 6	17.2	19.7	21.9	24.0	25.8	27.3	28.6	29.7	30.4

Example: A light is visible 17 miles, and is made 3 points on the bow. How far off will she pass the light, if course is not changed? Under 3 points and opposite 17 miles is the distance—9.4 miles.

Height of eye in feet.	Distance visible.	Height of eye in feet.	Distance visible.
5	2′.55	70	9′.56
10	3 .61	75	9 .90
15	4 .43	80	10 .22
20	5 .11	85	10 .54
25	5 .71	90	10 .84
30	6 .26	95	11 .14
35	6 .76	100	11 .43
40	7 .23	110	11 .99
45	7 .67	120	12 .52
50	8 .08	130	13 .03
55	8 .48	140	13 .52
60	8 .85	150	14 .00
65	9 .21	160	14 .46

Table of elevations of objects, with their distances of visibility.

Example: Sandy Hook light, height 90 feet, just visible. Height of eye 20 feet.

Tabular number for 90 feet 10′.84
" " " 20 " + 5 .11
Distance off the light = 15 .95

Nyack, N. Y., May 19, 1892.

Mr. H. Louderbough.

Dear Sir.—We take pleasure in giving you a testimonial on the good qualities of your Yacht Copper Paint for yacht bottoms. We have used this Paint on our work for two (2) seasons, and are pleased to say that we find it very satisfactory. It is easy to apply, and makes a smooth and bright finish. We also find it a good Anti-Fouling composition, and will soon have to place another order with you for our regular quantity. Yours very truly,

CHARLES L. SEABURY & CO.

Hoboken, N. J., Nov. 1, 1901.

Mr. H. Louderbough.

Dear Sir.—It is from long continued use of a marine paint that its merits become known, and we can testify that your New Jersey Marine Paints have all the merits claimed for them. For eleven years we have been ship-mates with them, and they have satisfied both our customers and ourselves.

Yours truly,

THE TIETJEN & LANG DRY DOCK CO.

Pensacola, Fla., Oct. 31, 1901.

Mr. H. Louderbough.

Dear Sir.—At our Railway and with our fleet of Fishing Vessels for several years we have used your "New Jersey" Copper Paint, and we take pleasure in giving our best endorsement for being a Paint of much merit, proving to us that your advertisement, of the fact it "Leads them all," has been established in our minds as being correct.

Very truly yours, E. E. SAUNDERS & CO.

Chance, Maryland, Oct. 7, 1901.

Mr. H. Louderbough.

Dear Sir.—In the use and sale of your "New Jersey" Copper Paint and your Yacht Red Copper Paint, I have found it a very good protection to vessels engaged in the oyster trade; it is a very great test for a paint to withstand the barnacles and grass growth so very prevalent in the waters of our Chesapeake Bay, and even under these trying conditions your Paint has made for itself many friends.

JAMES L. BENNETT.

Finding the Distance Off of any Fixed Object.

When a light is made at night, it is important that the distance off be known as soon as possible. Too frequently the distance is judged or more properly guessed and sometimes leads to disaster. It is often of equal importance to get the distance off of a light-house, point or other object during the day.

The method called the "four point bearing," is generally known to seamen and it has only one objection, that is, it gives the distance off when nearest the danger. However, there are many opportunities for its use when the ship is known to be outside the danger.

As an example, suppose the course is N. by E. and Barnegat light is made bearing N.N.W., which is 3 points on the port bow. How far off will the ship pass the light? On page 100 of the Light House book it is found that Barnegat light is visible 19 miles on a clear night. Enter the table on page 121 of this work with 19 miles and 3 points and it will be found that the ship will be 10.6 miles off when the light is abeam. Because of the continuous and uncertain changes of the atmosphere, this method can only be considered approximate; but will serve as a precaution. If the weather is such that the light is visible less than 19 miles, the ship will pass nearer the light; while if the distance the light is seen is more than 19 miles, the ship will pass the light at a greater distance. Continuing this course, note the reading of the log when the light bears N.W. by N., which will be four points on the bow. When the light is abeam note the reading of the log again. In this case it is found that the ship ran 10.6 miles, which was the distance off when the light was abeam. When the light was abeam, a sounding should be obtained and the depth compared with that on the chart. In this case the depth would be 14 fathoms and fixes the position of the ship with absolute certainty. Continuing on this course, note the log when the light bears S.W. by W., or four points abaft the beam. If the distance then run is less than 10.6 miles it is evident that a current, change in the deviation, or some other influence is setting the ship to port of her course. On the other hand, if the distance run is greater than 10.6 miles, she is being set to starboard of her course.

The only object in taking the bearing abaft the beam is to learn if the ship is making her course good, and if she is the distance must be 10.6 miles or very close to it. When the distances off of lights are obtained, it must be remembered that sometimes light-houses are well inland and the position of the light on the chart should be noticed. Also the least distance the ship can pass the light in safety.

Sometimes a light is made unexpectedly and it is not certain that the ship can stand on that course without danger. The light can be brought abeam and kept there until the original course is reached, when she will have circled part way around the light and clear any possible danger.

As an example, suppose the course to be N. ½ W., and Cape Canaveral light is made bearing N.N.W. The chart shows that the ship is standing into danger, and if the light is brought abeam or a little abaft it at once, the ship will be standing off-shore and out of danger. The course is altered as often as necessary to keep the light nearly abeam until she has the light abeam and heading N. ½ W., when she will be out of danger and may continue on her course. If in a case of this kind it is desired to know the distance of the light at once, bring it abeam, note the course and keep it until the bearing has changed to one point abaft the beam. The distance off at the time of the second bearing will be five times the distance run. In this case, say the ship ran 3.4 miles, changing the bearing one point $3'.4 \times 5 = 17.0$ miles, the distance off at time of second bearing, which according to the chart is a safe distance.

When sailing along high land, the heights of certain peaks are given on the chart, and the distance off may be accurately determined with the sextant and without any great amount of labor.

As an example, suppose the height of a peak or bold cliff is 1500 feet according to the chart. An altitude is observed with the sextant and found to be three degrees. Degrees are near enough in this angle; but as a matter of precaution use the greater degree.

Enter table 2 with the observed altitude as if a course. Find the height of the land in the departure column, and the corresponding number in the latitude column will be the distance off in feet. Divide the distance off by 6080 to reduce it to miles. In this case 15.00 is taken in the departure column, the decimal point having been moved two places to the left. Abreast of it in the latitude column is found 286.6. Moving this decimal point two places to the right makes the distance off 28660 feet. This divided by 6080, which is the number of feet in a nautical mile, gives the distance off 4.71 miles. The chief advantage of this method is that the distance off may be obtained at any time on any bearing. However, its use is restricted almost entirely to the day time; but may sometimes be used during moonlight nights.

Instead of table 2, table 33 in the latest edition of Bowditch may be used within certain limits.

There are many other methods more or less complicated, and various contrivances for getting the distance off; but those treated here are simple and practical and in some cases it is not necessary to leave the deck or put down a figure to obtain the distance off. It will be noticed that no excuse is left for one skinning around dangerous reefs, points of shoals, outlying rocks, etc., without an accurate knowledge of his distance off, or at least that the ship is outside the danger.

Distance by Sound.

This table shows the velocity of sound in feet per second of time for every second degree of temperature from 20° below zero to 102° above (Fahr.). The temperatures in heavy face type are below zero. The velocity of sound as given in the table is to be used in determining distance. The accuracy of the result depends on the weather being calm.

Deg. Temp. Farh.	Feet per Sec.	Deg. Temp. Fahr.	Feet per Sec.
20	1074	42	1105
18	1075	44	1106
16	1076	46	1107
14	1077	48	1108
12	1078	50	1109
10	1079	52	1110
8	1080	54	1111
6	1081	56	1112
4	1082	58	1113
2	1083	60	1114
Zero	1084	62	1115
2	1085	64	1116
4	1086	66	1117
6	1087	68	1118
8	1088	70	1119
10	1089	72	1120
12	1090	74	1121
14	1091	76	1122
16	1092	78	1123
18	1093	80	1124
20	1094	82	1125
22	1095	84	1126
24	1096	86	1127
26	1097	88	1128
28	1098	90	1129
30	1099	92	1130
32	1100	94	1131
34	1101	96	1132
36	1102	98	1133
38	1103	100	1134
40	1104	102	1135

Example: The flash of a gun was seen, and nine seconds later the report was heard. The temperature was 8° below zero. Find its distance.

Feet per second for 8°	1080
Interval	× 9s
Dist. in feet	9720=1′.6

Example: The vapor from a ship's whistle was seen, and eleven seconds later was heard. Temperature was 88°. Find her distance.

Feet per sec. for 88°	1128
Interval	× 11s
	1128
	1128
Dist. in feet	12408=2′.04

"New Jersey"

Copper Paint

Leads Them All.

Being Finely Ground it is Easy to Apply.

The success attending the introduction and sale of "NEW JERSEY" COPPER PAINT has been very remarkable. No other Copper Paint ever received such a rapid introduction, or is so strongly endorsed by Testimonials and Medals. Its guaranteed quality, its fineness, and being easy to apply, has made it greatly liked. It is of such a consistency (not being too thick or too thin) that it freely enters the wood, and at the same time it has body enough to produce a coating on the outside. In its double capacity it so poisons the wood that the worms will not enter, and its coating outside protects it from barnacles, grass, etc.

My long experience in this line has enabled me to produce a Copper Paint of which it can be justly said: "It Leads Them All."

Jersey City, May 26, 1890.

Mr. H. Louderbough.

Dear Sir.—At our two Dry Docks in Jersey City, during the past season, we have applied to our satisfaction on a large number of Vessels, the New Jersey Copper Paint, and must say our trade has been greatly pleased with the result from the use of your paint. Yours truly, BULMAN & BROWN.

Tottenville, N. Y., February 25, 1891.

Mr. H. Louderbough.

Dear Sir.— In the use of your New Jersey Seam Paint we are convinced of its merit. It is easy to work into seams, and as a substitute for pitch is the best we have ever used. It is elastic, very tough and durable. Respectfully yours,

W. H. SMITH & CO.

Perth Amboy, February 20, 1891.

Mr. H. Louderbough.

Dear Sir.—I take great pleasure endorsing both your New Jersey Seam Paint and your New Jersey Copper Paint. After using about all the Seam and Copper Paints made, it is my judgment that yours is the best I have ever used, your productions always being uniform, not too stout or too thin.

I remain, yours, &c., C. M. WHITAKER.

Seattle, Washington, Nov. 2, 1901.

Mr. H. Louderbough.

Dear Sir.—In connection with our paint and glass business, we have sold for several years your "New Jersey" Copper Paint in this market and vicinity, and the results have met with the general endorsements that "New Jersey" Copper Paint "Leads them all." Yours truly,

BAKER & RICHARDS.

Fog Signals.

That sound waves do not travel as far or as fast during foggy weather as they do when fine and clear, is due to the greater density of the atmosphere during thick weather, and is a fact that no seaman is in ignorance of.

Supposing the weather to be thick, but dead calm, there are reasonable distances at which the sound of certain fog signal apparatus would be expected to reach the ear; but no sound is heard. However, another vessel may be a half-mile or even a mile farther off and those on board hear the sound distinctly, a circumstance that is not at all uncommon. In running for a point that is directly ahead, the sound of the fog signal will be heard and then lost, and afterwards again heard and so, and during the time the signal will be in proper operation. And in running so as to pass the signal station a certain distance off, the sound is often heard when the station is three or four points on the bow and not heard when the station is abeam the point to which the passing ship approaches nearest to it; but heard again some time after passing the station.

Every seaman knows that the direction from which the sound of a fog signal comes cannot be located with any degree of certainty unless the sound producing device is quite close. In fact, there are times when the sound apparently comes from points of the compass directly opposite to each other. It seems reasonable, in this case, to suppose one of these sounds to be an echo of the original, but then there comes the difficulty of determining the original. Then again, instead of one of the sounds being an echo, they may be the fog signals of two different ships.

While navigators are quite familiar with the above phenomena, no theory has ever been advanced and accepted as a proper explanation.

A great number of descriptions and diagrams of sound waves have been examined, and as none can be found to satisfy the above conditions for explanatory purposes, it indicates that this very important branch of the subject has escaped the notice of those eminent scientists who investigate matters of this nature, which well deserves their attention. The only theory that seems to account for these so-called mysteries of sound, is that the sound waves increase in size as the distance from the source becomes greater until they become huge waves and pass over a ship that happens to be in that unfortunate position and descend so that those on board the ship at the greater distance would hear the sound.

It then appears that a ship running for a fog signal station that is directly ahead must pick up and lose the sound, as the signal cannot be heard when the sound waves are passing over the ship.

The same theory may be applied to the case of a ship having the fog signal station on her bow and passing it not at a great distance.

It has been noticed that as soon as a fog signal is heard sufficiently distinct to determine the interval of the blast and silence, and to locate the direction from which the sound comes, the source of the sound is not far off.

The only way to distinguish an echo from a fog signal is not to sound the signal with a uniform blast. Blow a very long or short blast occasionally. If a long blast is given and a short one is heard, or a short one is given and a long one heard, it is quite evident that the sound is not an echo. However, as a matter of safety and precaution, these sounds should not be considered as echoes at any time, as there are too many opportunities for fatal error. An echo will be heard all the time the same, while a fog signal will seem nearer or farther away at each blast.

It then follows that no dependence can be placed in fog signals so far as hearing their sounds any great distance, and when heard, it is not known whether they are near or not and the direction from which the sound comes cannot be determined by the ear. It is hoped that an instrument may be supplied for this purpose.

"WETTERSTEDT" COPPER PAINT.

This old brand of Copper Paint was for many years manufactured by Robert F. Seaman, and was the first copper paint made in this country, having been patented here on August 5, 1851. The trade that has always used it says that our manufacture of it has increased its virtues, it being smoother, and in its finer powdered condition the poison is more quickly taken up by the thinner, making it a better anti-fouling paint than ever before. The strong testimonials received have helped greatly its ever-increasing demand.

Duty to Stand-By after Collision.

AN ACT IN REGARD TO COLLISIONS AT SEA.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in every case of collision between two vessels it shall be the duty of the master or person in charge of each vessel, if and so far as he can do so without serious danger to his own vessel, crew, and passengers (if any), to stay by the other vessel until he has ascertained that she has no need of further assistance, and to render to the other vessel, her master, crew, and passengers (if any), such assistance as may be practicable and as may be necessary in order to save them from any danger caused by the collision, and also to give to the master or person in charge of the other vessel the name of his own vessel and her port of registry, or the port or place to which she belongs, and also the names of the ports and places from which and to which she is bound. If he fails so to do, and no reasonable cause for such failure is shown, the collision shall, in the absence of proof to the contrary, be deemed to have been caused by his wrongful act, neglect, or default.

Sec. 2. That every master or person in charge of a United States vessel who fails, without reasonable cause, to render such assistance or give such information as aforesaid shall be deemed guilty of a misdemeanor, and shall be liable to a penalty of one thousand dollars, or imprisonment for a term not exceeding two years; and for the above sum the vessel shall be liable and may be seized and proceeded against by process in any district court of the United States by any person; one-half such sum to be payable to the informer and the other half to the United States.

Sec. 3. That this act shall take effect at a time to be fixed by the President by Proclamation issued for that purpose.

Approved, September 4, 1890. Proclamation dated November 18, 1890, to take effect December 15, 1890.

Sunrise and Sunset.

By this table the apparent time of the sun's rising and setting, and the length of the day and night, may be determined.

	DECLINATION.															
LAT.	0°	2°	4°	6°	8°	10°	12°	14°	16°	18°	20°	22°	24°	26°	28°	30°
°	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m	h.m.	h.m.	h.m.	h.m.	h. m.
0	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00
5	6 00	6 01	6 01	6 02	6 03	6 04	6 04	6 05	6 06	6 07	6 07	6 08	6 09	6 10	6 11	6 12
10	6 00	6 01	6 03	6 04	6 06	6 07	6 09	6 10	6 12	6 13	6 15	6 16	6 18	6 20	6 22	6 23
15	6 00	6 02	6 04	6 06	6 09	6 11	6 13	6 15	6 18	6 20	6 22	6 25	6 27	6 30	6 33	6 36
20	6 00	6 03	6 06	6 09	6 12	6 15	6 18	6 21	6 24	6 27	6 30	6 34	6 37	6 41	6 45	6 49
25	6 00	6 04	6 07	6 11	6 15	6 19	6 23	6 27	6 31	6 35	6 39	6 43	6 48	6 53	6 57	7 02
30	6 00	6 05	6 09	6 14	6 19	6 23	6 28	6 33	6 38	6 43	6 49	6 54	7 00	7 05	7 12	7 18
35	6 00	6 06	6 11	6 17	6 23	6 28	6 34	6 40	6 46	6 53	6 59	7 06	7 13	7 20	7 27	7 35
40	6 00	6 07	6 13	6 20	6 27	6 34	6 41	6 48	6 56	7 03	7 11	7 19	7 28	7 37	7 46	7 56
45	6 00	6 08	6 16	6 24	6 32	6 41	6 49	6 58	7 07	7 16	7 25	7 35	7 46	7 57	8 08	8 21
50	6 00	6 10	6 19	6 29	6 39	6 49	6 59	7 09	7 20	7 31	7 43	7 55	8 08	8 22	8 37	8 54
55	6 00	6 11	6 23	6 35	6 46	6 58	7 11	7 23	7 37	7 51	8 05	8 21	8 38	8 57	9 18	9 42
60	6 00	6 14	6 28	6 42	6 56	7 11	7 26	7 42	7 59	8 17	8 36	8 58	9 22	9 51	10 28	12 00
65	6 00	6 17	6 34	6 52	7 10	7 29	7 48	8 09	8 32	8 57	9 25	10 00	10 51			
70	6 00	6 22	6 44	7 07	7 31	7 56	8 23	8 53	9 28	10 13	12 00					

LATITUDE AND DECLINATION OF SAME NAME.

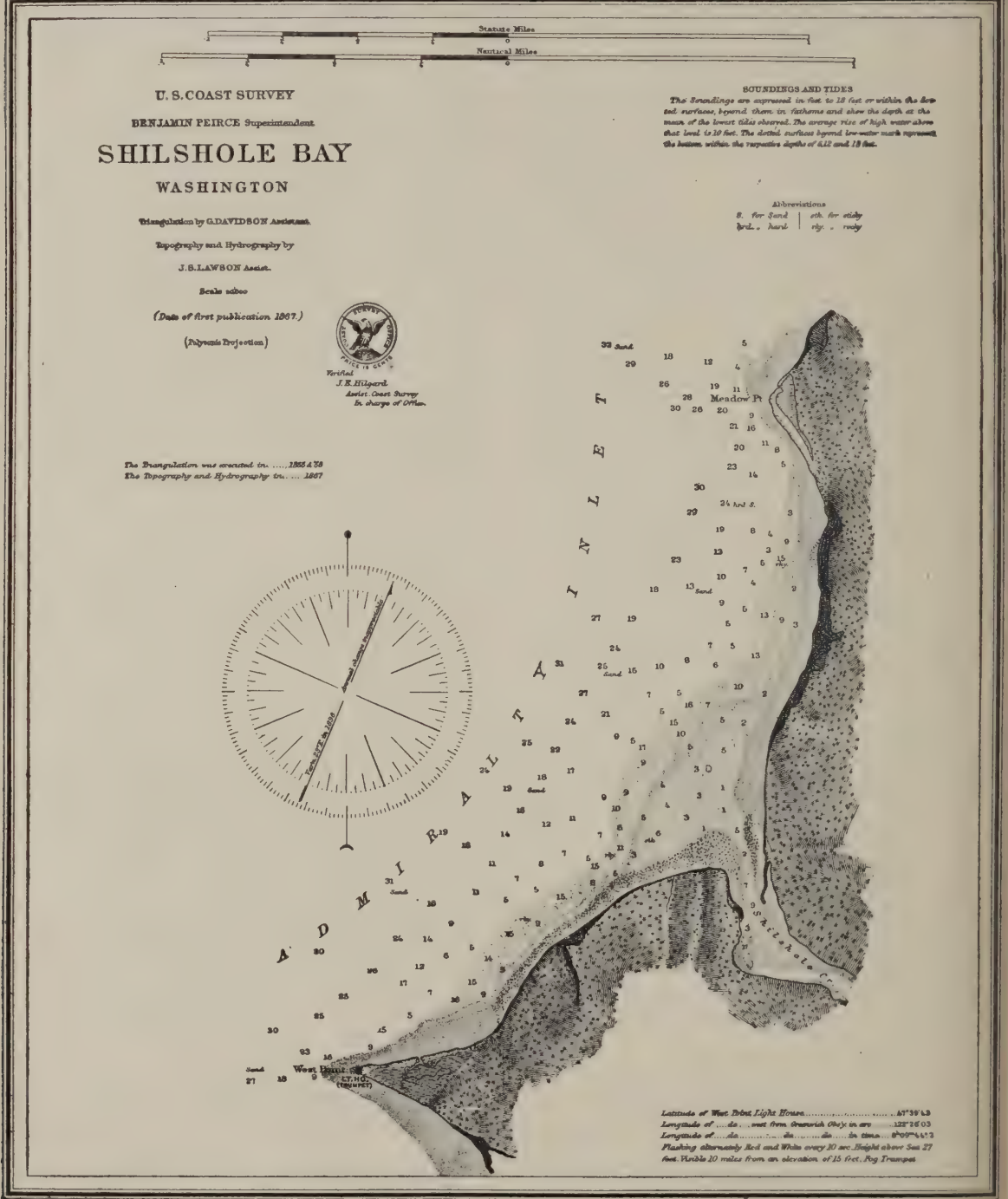
When the latitude and declination are of same name, the table gives the apparent time of sunset. To find the time of sunrise, subtract the time of setting from 12h 00m.

LATITUDE AND DECLINATION OF DIFFERENT NAME.

When the latitude and declination are of different name, the table gives the apparent time of sunrise. To find the time of sunset, subtract the time of rising from 12h 00m.

Double the time of sunset will give the length of the day.

Double the time of sunrise will give the length of the night.


Statute Miles
Nautical Miles
U. S. COAST SURVEY
BENJAMIN PEIRCE Superintendent
SHILSHOLE BAY
WASHINGTON
Triangulation by G. DAVIDSON Assistant.
Topography and Hydrography by
J. S. LAWSON Assist.
Scale 1:2500
(Date of first publication 1867.)
(Polyconic Projection)
Verified
J. E. Hilgard
Assist. Coast Survey
In charge of Office.
SOUNDINGS AND TIDES
The Soundings are expressed in feet, to 18 feet or within the laid-down surface, beyond them in fathoms and show the depth at the mean of the lowest tides observed. The average rise of high water above that level is 10 feet. The dotted surface beyond low-water mark represents the bottom within the respective depths of 6 & 12 and 18 feet.
Abbreviations
S. for Sand | sth. for stiky
brd. " hard | rky. " rocky
The Triangulation was executed in ..... 1855 & '58
The Topography and Hydrography in 1867
Meadow Pt
West Point
LT. HO.
(TRIUMET)
Shilshole Cr
Latitude of West Point Light House ..... 47°39'43
Longitude of ..... dia. ..west from Greenwich Obs'y, in arc ..... 122°26'03
Longitude of ..... dia. ..... dia. ..... in time ... 8h09m44s3
Flashing alternately Red and White every 30 sec. Height above Sea 27 feet. Visible 10 miles from an elevation of 15 feet. Fog Trumpet.

Engd by W. A. Thompson, J. G. Thompson and F. W. Bunnett

Yacht Rules.

The yachtsmen who are working to get uniformity in the measurement rules, time allowance and classification have almost finished their work, and this time their efforts have been successful. For nine years they have been striving to get together on this important question and have gradually worked up to a point where only a few minor differences had to be settled. A committee representing all the leading clubs between Capes May and Ann have met in the house of the New York Yacht Club at the invitation of that club, and it was an easy matter to adjust the differences. The main principles of the rule were adopted at a meeting of the whole committee and some small details were left to a sub-committee. This sub-committee met and it has finished its work satisfactorily and will report again to the whole committee, and then all that will remain to be done will be for the different clubs to ratify the work of the representatives.

The new rule might be called a compromise, but it is a good one and has been simplified as much as possible in its formula. The members of the committee realized that the main thing to accomplish was to get uniformity, and then having done that it would be simple later on to correct any errors that might be found. This is the formula adopted for classification and time allowance:

Rating measurement equals length multiplied by square root of sail area divided by 5.5 times cube root of displacement. The measurements shall be obtained as follows:

Length—Measured on a line parallel with the middle fore and aft vertical plane at a distance from it equal to one-quarter of the greatest beam at the load-water line and one-tenth of this beam above it. Any unfairness of form for the apparent purpose of shortening length shall be trued up and the yacht measured between fair lines.

The sail area is to be obtained in the old way of measuring the spars. The measurements are, however, to be made on the blue print of the sail plan and verified on the spars of the boat. This is in accordance with the custom of the Massachusetts association. After this has been done, the spars are to be marked showing the extreme points of measurement. The question of limiting the size of the club topsails caused some discussion, and it was agreed that these sails when used should not exceed 160 per cent. of the size of the jib header or working topsail. Spinnaker poles in the larger classes must not be larger than the base line of the forward triangle. As this limitation would not work fairly in the smaller classes, it was agreed that in Class P and under the spinnaker boom should be 40 per cent of the length of the base line of the sail plan. By actual measurement, it has been found that in larger boats the base of the forward triangle is from 37 to 40 per cent. of the whole base line, and so 40 per cent. was chosen for smaller boats.

Displacement is to be obtained as follows:

At points dividing the length of the load water line into five equal parts find areas of immersed cross sections in square feet; from the areas in square feet obtained and load water line length find approximate displacement in cubic feet.

There are limitations of load water line, draught and sail area, and any excess over these limitations will be penalized. One-half of any excess of load water line over 115 per cent. of the length is to be added to the rating measurement.

Draught is to be limited to 15 per cent. of the length, plus 2.50. Any excess over this limitation, exclusive of centreboard, is to be multiplied by three and added to the rating measurement.

Any excess of the square root of sail area over 135 per cent. of length is to be added to the rating measurement.

All boats launched after Jan. 1, 1905, must be built at the top of their respective classes. There will be no time allowance for such boats. Time allowance will be based on the regular rule, but only 70 per cent. of the allowance under the rule will be given. The New York club last year tried 80 per cent., while most of the other clubs allow 60 per cent. It is thought that this allowance will have to be modified to suit the weather conditions. On the Sound and down the bay light winds usually prevail and as high winds are required to give to larger vessels the full advantage of size, the 60 per cent. allowance has been found to work best. Further east, where the winds are stronger, a larger percentage is better. Another year this arbitrary allowance may be changed.

The new classification is to be as follows:

SCHOONERS.

Class A—All over 90 feet, racing measurement; crew, 48 persons.

Class B—Over 75 feet, not over 90 feet, racing measurement; crew, 35 persons.

Class C—Over 64 feet, not over 75 feet, racing measurement; crew, 25 persons.

Class D—Over 55 feet, not over 64 feet, racing measurement; crew, 20 persons.

Class E—55 feet or less, racing measurement; crew, 15 persons.

SLOOPS AND YAWLS.

Class F—All over 100 feet, racing measurement; crew, 48 persons.

Class G—Over 82 feet, not over 100 feet, racing measurement; crew, 35 persons.

Class H—Over 68 feet, not over 82 feet, racing measurement; crew, 20 persons.

Class J—Over 57 feet, not over 68 feet, racing measurement; crew, 15 persons.

Class K—Over 48 feet, not over 57 feet, racing measurement; crew, 12 persons.

Class L—Over 40 feet, not over 48 feet, racing measurement; crew, 9 persons.

Class M—Over 33 feet, not over 40 feet, racing measurement; crew, 7 persons.

Class N—Over 27 feet, not over 33 feet, racing measurement; crew, 5 persons.

Class P—Over 22 feet, not over 27 feet, racing measurement; crew, 4 persons.

Class Q—Over 18 feet, not over 22 feet, racing measurement; crew, 3 persons.

Class O—Over 15 feet, not over 18 feet, racing measurement; crew, 2 persons.

Class R—15 feet or less, racing measurement; crew, 2 persons.

CATBOATS.

Class S—Over 27 feet, not over 33 feet, racing measurement; crew, 5 persons.

Class T—Over 22 feet, not over 27 feet, racing measurement; crew, 4 persons.

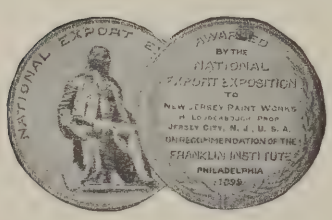
Class Q—Over 18 feet, not over 22 feet, racing measurement; crew, 3 persons.

Class W—18 feet or less, racing measurement; crew, 2 persons.

This classification is only adopted by different clubs as far as they go in giving register to yachts.

Now that one rule has been arranged for all clubs and yachtsmen know how things stand, it is expected that orders for new boats for the regular classes will be given at once, and that next season will see quite a boom in the regular class racing.

BACK LABEL IN FRENCH.

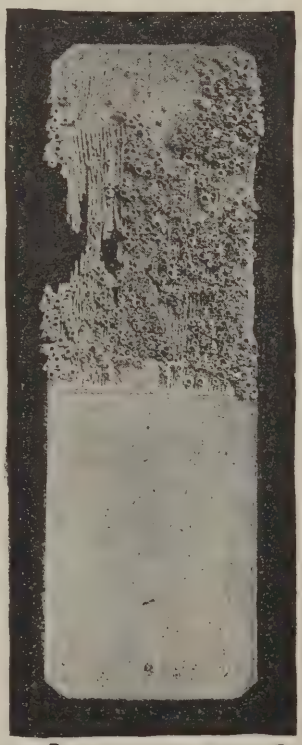


UNE MERVEILLE!

VOICI une copie de photographie d'une planche, dont l'un des deux bouts est au naturel tandis que l'autre est peint de **NEW JERSEY COPPER PAINT,** couleur fabriquée de cuivre. C'est de la fabrication de HARRY LOUDERBOUGH, propriétaire du NEW JERSEY PAINT WORKS, l'usine située à Jersey City en New Jersey. Cette planche fut mise à l'eau salée à Port Royal, en South Carolina, et y resta cinq mois. Voyons donc le bout sans couleur, comme il est rongé de vers, et quel grand nombre de morailles s'y sont attachées! tandis que le bout peint de cette merveilleuse couleur de cuivre reste tout a fait intact.

La planche que voici a été mise dans l'eau à Port Royal, S. C., par mes propres mains. Elle y est restée pendant cinq mois, à la fin desquels le bout peint était en aussi bon état que quand elle y fut mise.

Déposé par MILLS EDWARD,
Maitre du Schooner "Florence Shay."



PEINTURE DE CUIVRE
DE
NEW JERSEY.

ESPECIALITÉS
DE NOTRES
Peintures pour la Marine.

NEW JERSEY.

PEINTURES DE CUIVRE
PEINTURE rouge de cuivre
Pour les yats.
PEINTURE elastique pour coutures.
NOIR pour les YATS.
BLANCHE pour les YATS.
PEINTURE pour les Mâts.
Peinture pour les chimenees.
PEINTURE pour casque et pontes de bateau.

L'Institute Americaine de New York accordât a notres Peintures de Cuivre, et pour les coutures de bateau et preservatives de pilotes, la medaille de merite; le plus haute honneur accordè.

The World's Merchant Marine.

Statement of number and net and gross tonnage of steam and sailing vessels of over 100 tons of the several countries of the world, as recorded in Lloyd's Register for 1904-1905.

FLAG	STEAM			SAIL		TOTAL	
	Number	Net Tons	Gross Tons	Number	Net Tons	Number	Tonnage
British:							
United Kingdom	7,699	8,586,742	13,999,218	1,537	1,392,132	9,236	15,391,350
Colonies	1,088	516,333	867,309	926	322,186	2,014	1,189,845
Total	8,787	9,103,075	14,866,527	2,463	1,714,318	11,250	16,581,195
America (United States):							
Sea	880	869,563	1,311,208	2,090	1,279,141	2,970	2,590,349
Lake	386	846,071	1,129,586	55	129,465	441	1,259,051
Total	1,266	1,715,634	2,440,794	2,145	1,408,606	3,411	3,849,400
Argentine	112	39,758	64,325	95	24,474	207	88,799
Austro-Hungarian	271	354,392	569,990	19	15,166	290	585,156
Belgian	113	104,898	162,456	2	488	115	162,944
Brazilian	232	89,000	140,044	89	23,944	321	163,988
Chilean	54	43,376	69,681	63	39,204	117	108,885
Chinese	46	40,178	62,656	0	0	46	62,656
Colombian	3	1,313	2,445	4	934	7	3,379
Danish	396	297,343	505,127	407	92,857	803	597,984
Dutch	394	403,377	643,529	102	44,000	496	687,529
French	755	639,837	1,252,457	621	440,909	1,376	1,693,366
German	1,483	1,775,928	2,891,869	452	477,938	1,935	3,369,807
Greek	212	223,020	350,497	187	50,721	399	401,218
Haitian	6	1,083	2,052	0	0	6	2,052
Italian	368	460,869	720,209	870	467,357	1,238	1,187,566
*Japanese	591	418,613	668,360	7	3,057	598	671,417
Mexican	36	11,101	18,543	18	5,274	54	23,817
Montenegrin	0	0	0	21	5,319	21	5,319
Norwegian	1,038	620,985	1,017,248	1,180	700,406	2,218	1,717,654
Peruvian	5	3,341	5,132	31	10,012	36	15,144
Portuguese	47	32,617	51,240	149	47,761	196	99,001
Roumanian	18	10,815	19,318	3	634	21	19,952
Russian	650	375,449	609,622	720	230,893	1,370	840,515
Sarawak	4	1,402	2,270	1	669	5	2,939
Siamese	5	1,324	2,405	0	0	5	2,405
Spanish	455	445,620	714,172	124	40,683	579	754,855
Swedish	785	327,730	539,481	732	212,052	1,517	751,533
Turkish	125	58,241	93,259	207	60,408	332	153,667
Uruguayan	25	19,020	29,941	37	20,710	62	50,651
Venezuelan	10	1,715	3,210	9	1,282	19	4,492
Zanzibar	3	1,871	2,808	0	0	3	2,808
Other countries:							
Cuba	43	27,046	42,201	12	2,324	55	44,525
Philippine Islands	95	28,380	45,437	36	8,132	131	53,569
Various: Arabia, Salvador, Oman, Ecuador, Liberia, Samoa, Nicaragua, Bulgaria, Costa Rica, Egypt, Persia, Porto Rico, etc.	34	13,777	23,379	17	5,973	51	29,352
Total	18,467	17,692,141	28,632,684	10,823	6,156,505	29,290	34,789,189

*Japanese sailing vessels of under 300 tons are not recorded in Lloyd's.

Nothing Succeeds Like Success.

"New Jersey" Copper Paints and Marine Paints

Are a Success—So our Testimonials Say.

Towing Tandem.

Judge McPherson, in the United States District Court, handed down an opinion April 5, 1902, in which he directed that a decree be entered in favor of the owners of the British steamship Vedra against the tug John F. Gaynor, in the suit for damages growing out of a collision in the Delaware on June 16, 1899, in which the British boat was injured. The Vedra was on her way to port of destination from London and had stopped her engine as she approached Reedy Island Quarantine Station for the purpose of being examined by the government authorities. While this was going on the tug came down the river, towing two scows tandem. The tug kept her course closely, and managed herself to pass the steamship in safety, but the scows struck the anchored craft.

Judge McPherson exonerates the Verda from all charges of negligence. He says: "When the tug saw the steamship at anchor upon the water, with the quarantine flag flying, and knew that she was obliged to interrupt her voyage until the examination should be completed, it became the duty of the tug, as the moving vessel, to take every reasonable precaution to keep out of the way. As it seems to me, the collision is properly chargeable to the tug for approaching too close to the ship with so unwieldy a tow."

Largest Anchor Ever Forged.

The largest anchor ever forged has recently been turned out in the great forging shop at Charlestown Navy Yard. It weighs 16,500 pounds, and the cost of material and construction is nearly $2,000. Five men worked on it for over a month, hammering and smelting and welding it.

This great anchor is to form part of the equipment for one of the new battleships that are to be added to Uncle Sam's navy. The making of it was first tried as an experiment. It was not certain that an anchor of such size could be forged. Anchors of as great weight have been made of cast steel, and such are used on some ships of the American navy, as well as on British war-ships.

But, as cast steel is more likely to be broken, the navy officials desired to secure anchors of equal weight in wrought iron, and it has remained for the equipment department of the Charlestown yard to prove that their manufacture is possible. So great has been the success of this experiment that the government has ordered 22 of equal size and weight to be furnished, two for each of the 11 first-class battleships which are to be built.

This mammoth anchor, which, barring unusual conditions of undertow or violent storm, is sufficient to hold to her moorings the largest battleship afloat, is nearly 15 feet in length from crown to shackle, and about 9½ feet wide from one arm point to the other. The heavy cross bar is also about 15 feet in length. The palms, or broad flat pieces which are welded to the arm ends, are about 32 inches in width.

A specially heavy chain cable, larger than any hitherto made, is required to hold this anchor. The links of this cable, each one of which weighs, when complete, over 60 pounds, require a gang of men to pound and weld and smelt for half an hour in the joining of each one. 360 fathoms of this immense chain will be required for each anchor.

The officials of the equipment department in the navy yard are especially busy now. They say that in the forge shop they have anchors enough now ordered to fill all their time for the next four years. The steam hammer which is used in forging the anchors gives a stroke of 11 tons. The officers hope soon to have one giving a stroke of 25 tons. With that, they claim, they can get on much faster.

Don't Fail

To examine our Two Century Calendar between pages 177 and 180. It runs from 1801 to 2003; is very cleverly constructed, and is copyrighted.

Postage Rates and Conditions.

Foreign Mail should be fully prepaid, as double the amount of deficient postage is collected before delivery in countries of destination.

Full prepayment is required upon all registered articles; and postage upon all articles other than letters is required to be prepaid at least in part. Prepayment on ordinary letters (except to Canada, Mexico and Shanghai) is optional.

RATES OF POSTAGE TO FOREIGN COUNTRIES.

The rates of postage to all foreign countries (except Canada and Mexico, same as domestic rates) are as follows:

Letters, per 15 grams (½ oz.)		5 cents.
Postal Cards, each		2 cents.
Newspapers and other printed matter, per 2 ozs		1 cent.
Registration fee on letters or other articles		8 cents.
Commercial Papers.	Packages not in excess of 10 ozs	5 cents.
	Packages in excess of 10 ozs., each 2 ozs. or fract'n	1 cent.
Samples of Merchandise.	Packets not in excess of 4 ozs	2 cents.
	Packets in excess of 4 oz., each 2 oz. or fraction.	1 cent.
	Limit of Weight, 12 ozs.	

Limit of Weight—4 lbs. 6 ozs. (packages of printed matter and commercial papers).

Rates of postage to Newfoundland the same as to foreign countries.

UNITED STATES POSTAL AGENCY AT SHANGHAI.

Articles addressed for delivery at the following places in China, viz.:

CHEEFOO, or YENTAL,	**NEWSCHWANG,**
CHIN KIANG,	**NINGPO,**
CHUNG KING,	**OURGA,**
FOOCHOW,	**PEKING,**
HUNG CHOW,	**SHANGHAI,**
HANKOW,	**TAKU,**
ICHANG,	**TIENTSIN,**
KAIPING,	**WENCHOW,**
KALGAN,	**WUCHANG,**
KIUKIANG,	**WUHN,**
NANKING,	**YENTAL or CHEEFOO,**

are transmissible in the mails made up in San Francisco for the U. S. Postal Agency at Shanghai.

Articles of every kind and nature which are admitted to the United States domestic mails are admitted to the mails exchanged between the United States and the United States Postal Agency at Shanghai, China: subject, however, to the following rates of postage, which must be prepaid in all cases by means of United States postage stamps, on all articles except official correspondence in "penalty" envelopes.

First-class matter, 5 cents for each half ounce or fraction of half ounce.

Postal Cards, single, 2 cents each; double, 4 cents each.

Second and third-class matter, and samples of merchandise, not exceeding 12 ounces in weight, 1 cent for each 2 ounces or fraction of 2 ounces.

Fourth-class matter, one cent for each ounce or fraction of an ounce.

Registration fee, 8 cents; no additional charge for return receipt.

Articles other than letters in their usual and ordinary form must not be closed against inspection, but must be so wrapped or enclosed that they may be readily and thoroughly examined by postmasters and customs officers.

SPECIAL RATES AND CONDITIONS APPLYING TO CANADA AND MEXICO.

CANADA.

Articles of every kind or nature which are admitted to the domestic mails of either country are admitted at the same postage rates and under the same conditions to the mails exchanged between the two countries.

MEXICO.

All articles of every kind and nature which are admitted to the domestic mails of either country will be admitted under the same conditions to the mails exchanged between the two countries; except that articles of miscellaneous merchandise (fourth-class matter), not sent as bona fide trade samples, are required to be sent by "Parcels Post," and that commercial papers and bona fide trade samples are transmissible in the regular mails at the postage rate and subject to the conditions applicable to those articles in Postal Union Mails.

POSTAGE RATES BETWEEN THE UNITED STATES AND CUBA, PORTO RICO, HAWAII AND THE ISLAND POSSESSIONS.

All mail matter originating in the United States* for transmission to Cuba, Guam, the Philippine Archipelago, or Tutuila (including all adjacent Islands of the Samoan Group which are possessions of the United States), shall be subject to the United States domestic classification, conditions and rates of postage.

All mail matter originating in Cuba, Guam, the Philippine Archipelago, or Tutuila, for transmission to the United States, or from one

*Hawaii and Porto Rico are included in the term "United States;" and Guam, Tutuila, and the Philippine Archipelago are included in the term "Island Possessions."

to another of those islands, shall be subject to the United States domestic classification, conditions and rates of postage.*

The registration fee shall be eight cents, in addition to the lawful postage.

United States postage stamps shall be valid for the payment of postage in the island possessions; and the over-printed postage stamps of the island possessions shall be accepted in payment of postage wherever United States postage stamps are valid.

UNITED STATES WARSHIPS.

Mail for United States Warships in the waters of the United States, or at Porto Rico, Hawaii, the Philippines, Guam, Tutuila (Samoa), Cuba, China, Canada or Mexico, is subject to the domestic rates of postage.

Mail for United States Warships stopping at other foreign ports is subject to the foreign postage rates and conditions.

Mail for United States Warships addressed in care of the Postmaster at New York is promptly forwarded to destination by first opportunity.

PRIVATE MAILING CARDS.

To be entitled to the privileges given by this Act, mailing cards must conform to the following conditions:

1. Each card must be an unfolded piece of cardboard, not exceeding 3¼ by 5½ inches, and not less than 2 15-16 by 4 15-16 inches in size.

2. The quality and weight must be substantially that of the Government postal card of like size.

3. They may be of any color which does not interfere with the legibility of the address.

4. Each card must bear these words at the top of the address side "Private Mailing Card—Authorized by Act of Congress of May 19, 1898," placed thereon by means of printing or hand stamp.

5. Cards conforming to the conditions of paragraphs 1 to 4, inclusive, are admissible for transmission in the domestic mails, including Porto Rico, Guam, and the Philippine Islands, and to places in Canada and Mexico, at the postage rate of one cent each, prepaid by stamps affixed.

6. Cards conforming to the conditions of paragraphs 1 to 4, inclusive, will be rendered admissible to the Postal Union Mails by the addition of the words "Postal Card—Carte Postale" on the face near the top, either by writing, printing, or hand stamp, at the postage rate of two cents each, prepaid by stamps affixed.

7. The message on the cards may be in writing or in print, and the message side may bear advertisements and illustrations in any color.

8. The face of the cards shall be reserved for postage stamps, postmarks and addresses, which latter may be in writing, printing, or by means of a stamp or adhesive label of not more than three-fourths of an inch by two inches in size; provided that the sender may in the same manner place his name and address on the back or the face of the card, and that advertisements and illustrations may be printed on the face of the cards if they do not interfere with a perfectly distinct address and postmark.

PARCELS-POST MAILS.

Parcels Post Countries and Colonies.

ANQUILLA, LWD. IS.
ANTIGUA, LWD. IS.
BAHAMAS,
BARBADOS,
BRITISH GUIANA,
BARBUDA, LWD. IS.
BRITISH HONDURAS,
CAICOS ISLANDS
CHILE (See Exceptions)
COLOMBIA,
COSTA RICA,
DANISH WEST INDIES (St. Croix, St. John, St. Thomas.)
DOMINICA,
GUATEMALA,
GERMANY,
GRENADA, WWD. IS.
GRENADINES, WWD. IS.
HONDURAS (British)
HONDURAS (Republic of)
JAMAICA (including the Turks and Caico Isl'ds.)
LEEWARD ISLANDS (Antigua, with Barbuda and Rodonda, St. Kitts, Nevis, with Anquilla, Dominica, Montserrat, and the Virgin Islands.)
MEXICO,
MONTSERRAT, LWD. IS.
NEVIS, LWD. IS.
NEWFOUNDLAND,
NEW ZEALAND,
NICARAGUA,
REDONDA, LWD. IS.
REPUBLIC OF HONDURAS,
ST. CROIX, DAN. W. I. IS.
ST. JOHN, DAN. W. I. IS.
ST. KITTS, LWD. IS.
ST. LUCIA, WWD. IS.
ST. THOMAS, DAN. W. I. IS.
ST. VINCENT, WWD. IS.
SALVADOR,
TOBAGO,
TRINIDAD (including Tobago.)
TURKS ISLAND,
VENEZUELA,
VIRGIN ISLANDS, LWD. IS.
WINDWARD ISL'DS (Grenada, St. Vincent, Grenadines, and St. Lucia.)

Unsealed packages of mailable merchandise may be sent to above named places subject to the conditions herein prescribed, viz.:

Limit of weight.....11 pounds
Greatest length.....3 feet, 6 inches
Greatest length and girth combined.....6 feet
Postage...12 cents a pound or fraction thereof.

EXCEPTIONS.

Except that articles for Chile must be prepaid at the rate of 20 cents per pound or fraction thereof; and that parcels for Columbia, Costa Rica and Mexico, must not measure more than (2) two feet in length, or more than (4) four feet in girth.

To certain places in Mexico the limit of weight is 4 lbs., 6 ozs.

Note.—Additions to the above list may be made at any time.

*To insure prompt delivery, mail matter sent to persons in the United States service should include in the address the complete designation of the organization, company or regiment, vessel or other branch of the service to which the addressee belongs; and the postage thereon should be fully prepaid.

ADMISSIBLE AND PROHIBITED ARTICLES, ENCLOSURES, ETC.

Any articles admissible to the domestic mails of the United States may be sent by Parcels Post, except books that may violate the Copyright Laws of the countries addressed to.

CUSTOMS DECLARATIONS AND CERTIFICATES OF MAILING.

See that a "Customs Declaration" (which will be furnished on application at the Post Office or a Station) properly filled out, is pasted upon the parcel.

Customs Declarations should be attached to, but not pasted on parcels for Germany.

Parcels for Salvador should have one extra copy, and parcels for Venezuela two extra copies of the Customs Declarations attached (not pasted) thereto.

REGISTERED PARCELS.

The sender of a parcel addressed to any of the countries named in the table at the head of this article, except Barbados, may have the same registered by paying a registration fee of 8 cents, and will receive the "Return Receipt" without special charge therefor; but the Post Office Department will in no case be responsible for the loss or damage of any parcel.

RETURN RECEIPTS FOR ORDINARY PARCELS.

The sender of an ordinary (unregistered) parcel addressed to Jamaica, Barbados, the Bahamas and British Honduras, may obtain a "Return Receipt" for the same by prepaying by means of postage stamps, a fee of 5 cents in addition to the ordinary postage. In such cases the words "Return Receipt Demanded" should be plainly written on the cover of the parcel.

CUSTOMS AND POSTAGE CHARGES ON DELIVERY.

Dutiable articles received in the United States in Parcels Post mail will be rated and charged with the proper amount of customs duty by the customs officer at the United States exchange post office at which said mails are received from abroad, and the duty so rated will be collected and remitted to said customs officer by the postmaster who delivers the article.

On the delivery of a parcel to the addressee a postage charge of 5 cents will be collected on each single parcel of whatever weight; and if the weight exceeds 1 pound, a charge of 1 cent for each 4 ounces of weight or fraction thereof will be collected; except that parcels mailed in the Danish West Indies are subject to a maximum charge of 10 cents; and that upon parcels mailed in British Guiana, the Windward Islands, Newfoundland, Trinidad, Chili, Guatemala and Germany, not more than 5 cents is collectable on the delivery of any parcel.

RETURN AND REDIRECTION OF PARCELS.

Senders of parcels for or from Jamaica, Barbados, the Leeward Islands, British Guiana, the Windward Islands and Trinidad, who request their parcels to be returned, or forwarded to a different destination, must transmit with their request the amount necessary to repay postage afresh at the rate of 12 cents per pound or fraction of a pound.

DOMESTIC POSTAGE.

First-Class Matter—Letters and all other written matter (whether sealed or not) excepting manuscript copy accompanying proof sheets, also all matter sealed (see below) 2 cents an ounce, excepting drop letters at Non-Carrier offices, 1 cent an ounce. (Postal Cards 1 cent each.)

Second-Class—Newspapers and periodicals published quarterly and oftener and not for gratuitous distribution. The general public pay by affixing stamps at the rate of 1 cent for each 4 ounces or part thereof when not sealed.

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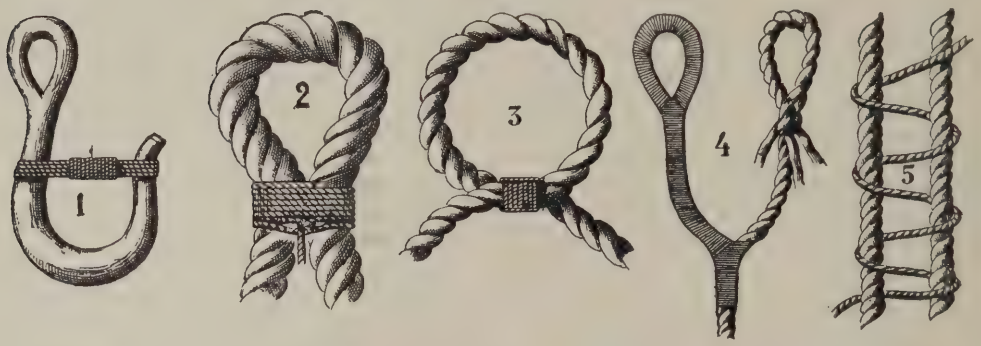
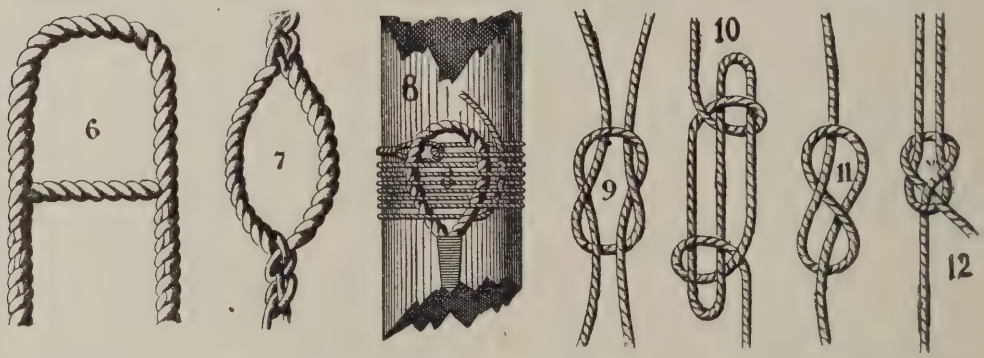
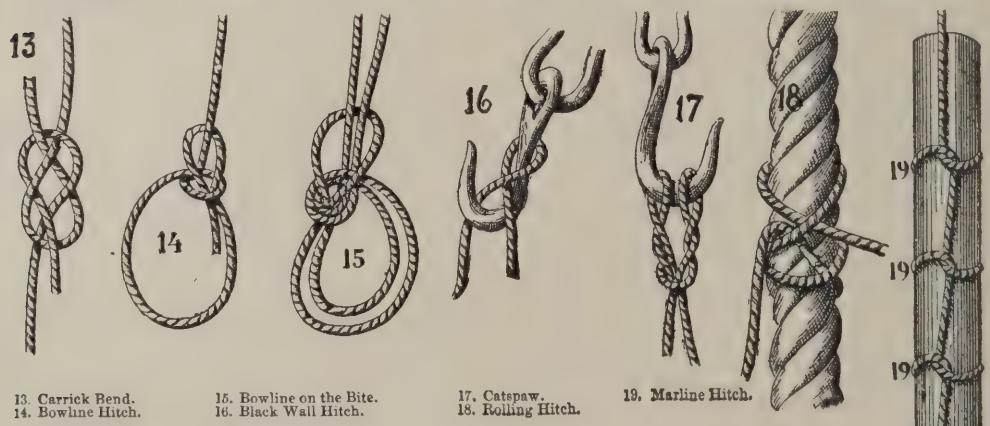


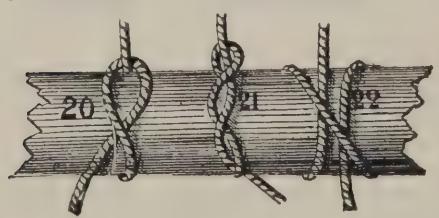
1. Mousing. 2. Throat Seizing. 3. Half a Crown. 4. Fork and Lashing Eyes. 5. Racking.



6. Horse Shoe Splice. 7. Cut Splice. 8. Rose Lashing. 9. Reef Knot. 10. Sheep Shank. 11. Figure of Eight Knot. 12. Single Bend.



13. Carrick Bend.
14. Bowline Hitch.
15. Bowline on the Bite.
16. Black Wall Hitch.
17. Catspaw.
18. Rolling Hitch.
19. Marline Hitch.



20. Half Hitch.
21. Timber Hitch.
22. Clove Hitch.

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PILOT RULES

—FOR—

ATLANTIC AND PACIFIC COAST INLAND WATERS.

Rules and Regulations for the government of pilots of vessels propelled by steam, gas, fluid, naphtha, or electric motors, and of other vessels propelled by machinery, navigating the harbors, rivers, and inland waters of the United States (except the Great Lakes and their connecting and tributary waters as far East as Montreal, the Red River of the North, and rivers emptying into the Gulf of Mexico, and their tributaries). Adopted by the Board of United States Supervising Inspectors in January, 1902, and approved by the Secretary of Commerce and Labor, July 6, 1904, under the authority of an act of Congress approved June 7, 1897, and the act of Congress approved February 14, 1903, establishing the Department of Commerce and Labor.

In the following rules the words "steam-vessel" and "steamer" shall include any vessel propelled by machinery.

RULE I. (Article 18, Act of Congress approved June 7, 1897.) When steam-vessels are approaching each other head and head, that is, end on, or nearly so, it shall be the duty of each to pass on the port side of the other; and either vessel shall give, as a signal of her intention, one short and distinct blast of her whistle, which the other vessel shall answer promptly by a similar blast of her whistle, and thereupon such vessels shall pass on the port side of each other. But if the courses of such vessels are so far on the starboard of each other as not to be considered as meeting head and head, either vessel shall immediately give two short and distinct blasts of her whistle, which the other vessel shall answer promptly by two similar blasts of her whistle, and they shall pass on the starboard side of each other.

The foregoing only applies to cases where vessels are meeting end on or nearly end on, in such a manner as to involve risk of collision; in other words, to cases in which, by day, each vessel sees the masts of the other in a line, or nearly in a line with her own, and by night to cases in which each vessel is in such a position as to see both the side-lights of the other.

It does not apply by day to cases in which a vessel sees another ahead crossing her own course, or by night to cases where the red light of one vessel is opposed to the red light of the other, or where the green light of one vessel is opposed to the green light of the other, or where a red light without a green light, or a green light without a red light, is seen ahead, or where both green and red lights are seen anywhere but ahead.

RULE II. When steamers are approaching each other in an oblique direction, as shown in the diagrams of the fourth and fifth situations, so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way of the other, which latter vessel shall keep her course and speed; the steam vessel having the other on her starboard side indicating by one blast of her whistle her intention to direct her course to starboard, so as to cross the stern of the other steamer; and two blasts, her intention of directing her course to port, which signals must be promptly answered by the steamer having the right of way, but the giving and answering signals by a vessel required to keep her course shall not vary the duties and obligations of the respective vessels.

RULE III. If, when steam-vessels are approaching each other, either vessel fails to understand the course or intention of the other, from any cause, the vessel so in doubt shall immediately signify the same by giving several short and rapid blasts, not less than four, of the steam whistle; and, if the vessels shall have approached within half a mile of each other, both shall be immediately slowed to a speed barely sufficient for steerageway until the proper signals are given, answered, and understood, or until the vessels shall have passed each other.

Vessels approaching each other from opposite directions are forbidden to use what has become technically known among pilots as "cross signals"—that is, answering one whistle with two, and answering two whistles with one. In all cases, and under all circumstances, a pilot

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receiving either of the whistle signals provided in the rules, which for any reason he deems injudicious to comply with, instead of answering it with a cross signal, must at once observe the provisions of this rule.

RULE IV. When steamers are running in a fog, mist, falling snow, or heavy rain storms, except when towing, it shall be the duty of the pilot to cause a long blast of the whistle to be sounded at intervals not exceeding one minute.

A steam vessel when towing shall, at intervals of not more than one minute, sound three blasts in succession, namely, one prolonged blast, followed by two short blasts. A vessel towed may give this signal and she shall not give any other.

A vessel is "under way," within the meaning of these rules, when she is not at anchor, or made fast to the shore, or aground.

Every steam vessel shall, in a fog, mist, falling snow, or heavy rain storms, go at a moderate speed, having careful regard to the existing circumstances and conditions.

A steam vessel hearing, apparently forward of her beam, the fog signal of a vessel the position of which is not ascertained shall, so far as the circumstances of the case admit, stop her engines, and then navigate with caution until danger of collision is over.

RULE V. (Act of June 7, 1897.) Whenever a steam vessel is nearing a short bend or curve in the channel, where, from the height of the banks or other cause, a steam-vessel approaching from the opposite direction can not be seen for a distance of half a mile, such steam-vessel, when she shall have arrived within half a mile of such curve or bend, shall give a signal by one long blast of the steam whistle, which signal shall be answered by a similar blast, given by any approaching steam-vessel that may be within hearing. Should such signal be so answered by a steam-vessel upon the farther side of such bend, then the usual signals for meeting and passing shall immediately be given and answered; but, if the first alarm signal of such vessel be not answered, she is to consider the channel clear and govern herself accordingly.

When steam-vessels are moved from their docks or berths, and other boats are liable to pass from any direction toward them, they shall give the same signal as in the case of vessels meeting at a bend, but immediately after clearing the berths so as to be fully in sight they shall be governed by the steering and sailing rules.

RULE VI. The signals, by the blowing of the whistle, shall be given and answered by pilots, in compliance with these rules, not only when meeting "head and head," or nearly so, but at all times when passing or meeting at a distance within half a mile of each other, and whether passing to the starboard or port.

RULE VII. When two steamers are approaching the narrows known as "Hell Gate," on the East River at New York, side by side, or nearly so, running in the same direction, the steamer on the right or starboard hand of the other (when approaching from the west), when they shall have arrived abreast of the north end of Blackwells Island, shall have the right of way, and the steamer on the left or port side shall check her way and drop astern. In like case when two steamers are approaching from the east, and are abreast of Negro Point, the steamer on the right or starboard hand of the other shall have the right of way, and shall proceed on her course without interference, and the steamer on the port side of the other shall keep at a safe distance astern (not less than three lengths), until both steamers have passed through the difficult channel.

RULE VIII. (Act of June 7, 1897.) When steam-vessels are running in the same direction, and the vessel which is astern shall desire to pass on the right or starboard hand of the vessel ahead, she shall give one short blast of the steam-whistle, as a signal of such desire, and if the vessel ahead answers with one blast, she shall put her helm to port; or if she shall desire to pass on the left or port side of the vessel ahead, she shall give two short blasts of the steam-whistle, as a signal of such desire, and if the vessel ahead answers with two blasts, shall put her helm to starboard; or if the vessel ahead does not think it safe for the vessel astern to attempt to pass at that point, she shall immediately signify the same by giving several short and rapid blasts of the steam-whistle, not less than four, and under no circumstances shall the vessel astern attempt to pass the vessel ahead until such time as they have reached a point where it can be safely done, when said vessel ahead shall signify her willingness by blowing the proper signals. The vessel ahead shall in no case attempt to cross the bow or crowd upon the course of the passing vessel.

RULE IX. (Act of June 7, 1897.) The whistle signals provided in the rules under this article, for steam-vessels meeting, passing, or overtaking are never to be used except when steamers are in sight of each other, and the course and position of each can be determined in the daytime by a sight of the vessel itself, or by night by seeing its signal lights. In fog, mist, falling snow, or heavy rainstorms, when vessels cannot so see each other, fog-signal only must be given.

RULE X. All double-end ferryboats on lakes and seaboard shall carry a central range of clear bright, white lights, showing all around the horizon, placed at equal altitudes forward and aft; also such side lights as specified in act of June 7, 1897, Art. 2, paragraphs (b) and (c).

Local inspectors in districts having ferryboats shall, whenever the safety of navigation may require, designate for each line of such boats a certain light, white or colored, which shall show all around the horizon, to designate and distinguish such lines from each other, which light shall be carried on a flagstaff amidships, 15 feet above the white range lights.

The line dividing jurisdiction between pilot rules on Western rivers and harbors, rivers and inland waters, at New Orleans, shall be the lower limits of the city.

LIGHTS FOR BARGES AND CANAL BOATS IN TOW OF STEAM VESSELS.

RULE XI. On the inland rivers, bays, sounds and harbors of the United States—except on the waters of the Hudson River and its tributaries from Troy to Sandy Hook, the waters of the East River and Long Island Sound, and the waters entering thereon, and to the Atlantic Ocean, to and including Narragansett Bay, R. I., and tributaries, and Lake Champlain—barges and canal boats towing astern of steam vessels, when towing singly, or what is known as tandem towing, shall each carry a green light on the starboard side and a red light on the port side.

When two or more boats are abreast the colored lights shall be carried at the outer sides of the bows of the outside boats.

Barges or canal boats towing alongside a steam vessel shall, if the deck, deck houses, or cargo of the barge or canal boat be so high above water as to obscure the side lights of the towing steamer, when being towed on the starboard side of the steamer, carry a green light upon the starboard side; and when towed on the port side of the steamer, a red light on the port side of the barge or canal boat; and if there is more than one barge or canal boat abreast, the colored lights shall be displayed from the outer side of the outside barges or canal boats.

Barges and canal boats, when being towed by steam vessels on the waters of the Hudson River and its tributaries from Troy to Sandy Hook, the East River, and Long Island Sound (and the waters entering thereon, and to the Atlantic Ocean), to and including Narragansett Bay, R. I., and tributaries, and Lake Champlain, shall carry lights as follows:

Barges and canal boats being towed astern of steam vessels, when towing singly or what is known as tandem towing, shall each carry a white light on the bow and a white light on the stern.

Barges and canal boats when towed at a hawser two or more abreast, when in one tier, shall carry a white light on the bow and a white light on the stern of each of the outside boats; when in more than one tier, each of the outside boats shall carry a white light on its bow; and the outside boats in the last tier shall each carry, in addition, a white light on the outer after part of stern.

Barges or canal boats towed alongside a steam vessel, if on the starboard side of said steam vessel, shall display a white light on her own starboard bow; and if on the port side of said steam vessel, shall display a white light on her own port bow; and if there is more than one barge or canal boat alongside, the white lights shall be displayed from the outboard side of the outside barge or canal boat. Provided, That car floats of 200 feet or over in length shall have a white light at each outboard corner of said floats.

When barges or canal boats are massed in tiers and towed at a hawser as is usual on the Hudson River, there shall be carried on the forward port side of the port boat of each tier a white light, and on the forward starboard side of the starboard boat in each tier a white light, and on the after port side of the port boat in the stern tier a white light, and on the after starboard side of the starboard boat in the stern tier a white light.

The white lights for barges and canal boats referred to in the preceding rules shall be carried at least 10 feet and not more than 30 feet abaft the stem or extreme forward end of the vessel, above the deck rail of the vessel on single-decked vessels, and on the upper deck of double or three-decked barges or canal boats; and shall be of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least 5 miles.

The colored side lights referred to in the foregoing rules must be fitted with inboard screens, so as to prevent them from being seen across the bow, and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least 2 miles, and so constructed as to show a uniform and unbroken light over an arc of the horizon of 10 points of the compass, and so fixed as to throw the light from right ahead to 2 points abaft the beam on either side. The minimum size of glass globes shall not be less than 6 inches in diameter, and 5 inches high in the clear.

Any barge or canal boat in tow of a steam vessel, when the last boat of a tow, and not required by these rules to carry a light on the stern, on being overtaken by another vessel, shall show from her stern to such last-mentioned vessel a flare-up light; or, in lieu thereof, a white light fixed and carried in a lantern, which shall be so constructed, fitted and screened that it shall throw an unbroken light over an arc of the horizon of 12 points of the compass, viz., for 6 points from right aft on each side of the vessel, so as to be visible at a distance of at least one mile.

Provided, That nothing in these rules shall be construed as compelling barges or canal boats in tow of steam vessels, passing through any waters en route or directly to or from a port where lights for barges or canal boats are different from those of the waters whereon such vessels are usually employed, to change their lights from those required on the waters from which their trip begins or terminates; but should such vessels engage in local employment on waters requiring different lights from those where they are customarily employed, they shall comply with the local rules where employed.

All scows without rudders or other means of guidance, being towed by hawser behind steam vessels on any navigable waters of the United States, shall carry a regulation white light at each end of each scow (such lights to be carried not less than 6 feet above the deck), as shown in diagrams No. 4, Department Circular No. 27, dated February 13, 1894. When scows are towed two or more abreast, they shall carry the regulation white lights, as shown in diagrams No. 7, Department Circular No. 27, dated February 13, 1894.

When scows are towed two or more abreast, they shall carry the regulation white lights, as shown in diagrams No. 7, Department Circular No. 27, 1894.

All the rules relating to lights, fog-signals, steering and sailing, contained in act approved June 7, 1897, and applying to steam vessels shall also apply to all vessels propelled by gas, fluid, naphtha, or electric motors, and between any of such vessels and steam vessels on the Atlantic and Pacific coast inland waters; with the exception that the red and green lights on open vessels of 10 gross tons and under, propelled by gas, fluid, naphtha, or electric motors, may be exhibited from a combined lantern showing a red light and a green light, as described in act approved June 7, 1897, in lieu of all other lights required for vessels under way. When the range and side lights are carried on such vessels of 10 gross tons and under, the after range light shall be carried at an elevation of at least 7 feet above the light at the head of the vessel. Such vessels of 10 gross tons and under, if provided with a bell of 6 inches in diameter, of good tone and quality, to be rung by hand in fog or thick weather, shall be deemed to be properly equipped in that respect.

The Board of Supervising Inspectors, at their annual meeting of January, 1900, adopted the following resolution relating to the use of search lights:

Resolved, That masters, mates, and pilots of all vessels be required to exercise due caution in the use of their search lights so as not to throw the rays of the light into the pilot house of passing steamers.

DIAGRAMS.

The following diagrams are intended to illustrate the working of the foregoing system of colored lights, and are to be used by pilots in connection with the rules, as sailing directions on meeting or nearing other steamers:

FIRST SITUATION.

Here the two colored lights visible to each will indicate their direct approach "head and head" toward each other. In this situation it is a standing rule that both shall put their helms to port and pass to the right, each having previously given one blast of the whistle.

SECOND SITUATION.

Here the green light only will be visible to each, the screens preventing the red light from being seen. They are therefore passing to starboard, which is rulable in this situation, each pilot having previously signified his intention by two blasts of the whistle.

THIRD SITUATION.

A and B will see each other's red light only, the screens preventing the green lights from being seen. Both vessels are evidently passing to port, which is rulable in this situation, each pilot having previously signified his intention by one blast of the whistle.

FOURTH AND FIFTH SITUATIONS.

When steamers are approaching each other in an oblique direction, as indicated in the diagrams of the fourth and fifth situations, so that a continuation of their courses would involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way of the other, and shall, if necessary to do so, slacken her speed, or stop and reverse; indicating her intention by either one or two blasts of the whistle, as the circumstances may require.

The manner of fixing the colored lights should be particularly attended to. They will require to be fitted each with a screen, of wood or canvas, on the inboard side, and close to the light, in order to prevent both being seen at the same moment from any direction but that of right ahead to two points abaft the beam.

This is important, for without the screens any

plan of bow lights would be ineffectual as a means of indicating the direction of steering. This would be readily understood by a reference to the preceding illustrations, where it will appear evident that in any situation in which two vessels may approach each other in the dark the colored lights will instantly indicate to both the relative course of each; that is, each will know whether the other is approaching directly, or crossing the bows either to the starboard or port.

This intimation, with the signals by whistle, as provided, is all that is required to enable vessels to pass each other in the darkest night with almost equal safety as in broad day. If at anchor, all vessels, without distinction, must exhibit a bright white light or lights, as required by Art. 11 of the act of Congress approved June 11, 1897.

AN ACT to adopt regulations for preventing collisions upon certain harbors, rivers, and inland waters of the United States.

Whereas the provisions of chapter eight hundred and two of the laws of eighteen hundred and ninety, and the amendments thereto, adopting regulations for preventing collisions at sea, apply to all waters of the United States connected with the high seas navigable by sea-going vessels, except so far as the navigation of any harbor, river, or inland waters is regulated by special rules duly made by local authority; and

Whereas it is desirable that the regulations relating to the navigation of all harbors, rivers, and inland waters of the United States, except the Great Lakes and their connecting and tributary waters as far east as Montreal and the Red River of the North and rivers emptying into the Gulf of Mexico and their tributaries, shall be stated in one Act: Therefore,

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following regulations for preventing collisions shall be followed by all vessels navigating all harbors, rivers, and inland waters of the United States, except the Great Lakes and their connecting and tributary waters as far east as Montreal and the Red River of the North and rivers emptying into the Gulf of Mexico and their tributaries, and are hereby declared special rules duly made by local authority:

PRELIMINARY.

In the following rules every steam-vessel which is under sail and not under steam is to be considered a sailing-vessel, and every vessel under steam, whether under sail or not, is to be considered a steam-vessel.

The word "steam-vessel" shall include any vessel propelled by machinery.

A vessel is "under way," within the meaning of these rules, when she is not at anchor, or made fast to the shore, or aground.

RULES CONCERNING LIGHTS, AND SO FORTH.

The word "visible" in these rules, when applied to lights, shall mean visible on a dark night with a clear atmosphere.

Article 1. The rules concerning lights shall be complied with in all weathers from sunset to sunrise, and during such time no other lights which may be mistaken for the prescribed lights shall be exhibited.

Art. 2. A steam-vessel when under way shall carry—(a) On or in front of the foremast, or, if a vessel without a foremast, then in the fore part of the vessel, a bright white light so constructed as to show an unbroken light over an arc of the horizon of twenty points of the compass, so fixed as to throw the light ten points on each side of the vessel, namely, from right ahead to two points abaft the beam on either side, and of such a character as to be visible at a distance of at least five miles.

(b) On the starboard side a green light so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the starboard side, and of such a character as to be visible at a distance of at least two miles.

(c) On the port side a red light so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the port side, and of such a character as to be visible at a distance of at least two miles.

(d) The said green and red side-lights shall be fitted with inboard screens projecting at least three feet forward from the light, so as to prevent these lights from being seen across the bow.

(e) A sea-going steam-vessel when under way may carry an additional white light similar in construction to the light mentioned in subdivision (a). These two lights shall be so placed in line with the keel that one shall be at least fifteen feet higher than the other, and in such a position with reference to each other that the lower light shall be forward of the upper one. The vertical distance between these lights shall be less than the horizontal distance. (f) All steam-vessels (except sea-going vessels and ferry-boats), shall carry in addition to green and red lights required by article two (b), (c),

and screens as required by article two (d), a central range of two white lights; the after-light being carried at an elevation at least fifteen feet above the light at the head of the vessel. The head-light shall be so constructed as to show an unbroken light through twenty points of the compass, namely, from right ahead to points abaft the beam on either side of the vessel, and the after-light so as to show all around the horizon.

Art. 3. A steam-vessel when towing another vessel shall, in addition to her side-lights, carry two bright white lights in a vertical line one over the other, not less than three feet apart, and when towing more than one vessel shall carry an additional bright white light three feet above or below such lights, if the length of the tow measuring from the stern of the towing vessel to the stern of the last vessel towed exceeds six hundred feet. Each of these lights shall be of the same construction and character, and shall be carried in the same position as the white light mentioned in article two (a) or the after range light mentioned in article two (f).

Such steam-vessel may carry a small white light abaft the funnel or aftermast for the vessel towed to steer by, but such light shall not be visible forward of the beam.

Art. 5. A sailing-vessel under way or being towed shall carry the same lights as are prescribed by article two for a steam-vessel under way, with the exception of the white lights mentioned therein, which they shall never carry.

Art. 6. Whenever, as in the case of vessels of less than ten gross tons under way during bad weather, the green and red side-lights can not be fixed, these lights shall be kept at hand, lighted and ready for use; and shall, on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent collision, in such manner as to make them most visible, and so that the green light shall not be seen on the port side nor the red light on the starboard side, nor, if practicable, more than two points abaft the beam on their respective sides. To make the use of these portable lights more certain and easy the lanterns containing them shall each be painted outside with the color of the light they respectively contain, and shall be provided with proper screens.

Art. 7. Rowing boats, whether under oars or sail, shall have ready at hand a lantern showing a white light which shall be temporarily exhibited in sufficient time to prevent collision.

*Art. 8. Pilot-vessels when engaged on their station on pilotage duty shall not show the lights required for other vessels, but shall carry a white light at the masthead, visible all around the horizon, and shall also exhibit a flare-up light or flare-up lights at short intervals, which shall never exceed fifteen minutes.

On the near approach of or to other vessels they shall have their side-lights lighted, ready for use, and shall flash or show them at short intervals, to indicate the direction in which they are heading, but the green light shall not be shown on the port side nor the red light on the starboard side.

A pilot-vessel of such a class as to be obliged to go alongside of a vessel to put a pilot on board may show the white light instead of carrying it at the masthead, and may instead of the colored lights above mentioned, have at hand, ready for use, a lantern with a green glass on the one side and a red glass on the other, to be used as prescribed above.

Pilot-vessels, when not engaged on their station on pilotage duty, shall carry lights similar to those of other vessels of their tonnage.

Art. 9. (a) Fishing-vessels of less than ten gross tons, when under way and when not having their nets, trawls, dredges, or lines in the water, shall not be obliged to carry the colored side-lights; but every such vessel shall, in lieu thereof, have ready at hand a lantern with a green glass on one side and a red glass on the other side, and on approaching to or being approached by another vessel such lantern

*AN ACT Relating to lights on steam pilot vessels.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That a steam pilot vessel, when engaged on her station on pilotage duty and in waters of the United States, and not at anchor, shall, in addition to the lights required for all pilot boats, carry at a distance of eight feet below her white masthead light a red light, visible all around the horizon and of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least two miles, and also the colored side lights required to be carried by vessels when under way.

When engaged on her station on pilotage duty and in waters of the United States, and at anchor, she shall carry in addition to the lights required for all pilot boats the red light above mentioned, but not the colored side lights.

When not engaged on her station on pilotage duty, she shall carry the same lights as other steam vessels.

SEC. 2. That this Act shall be construed as supplementary to article eight of the Act approved June seventh, eighteen hundred and ninety-seven, entitled "An Act to adopt regulations for preventing collisions upon certain harbors, rivers, and inland waters of the United States," and to article eight of an Act approved August nineteenth, eighteen hundred and ninety, entitled "An Act to adopt regulations for preventing collisions at sea."

SEC. 3. That this Act shall take effect on June thirtieth, nineteen hundred.

Approved, February, 19, 1900.

shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side nor the red light on the starboard side.

(b) All fishing-vessels and fishing-boats of ten gross tons or upward, when under way and when not having their nets, trawls, dredges, or lines in the water, shall carry and show the same lights as other vessels under way.

(c) All vessels, when trawling, dredging, or fishing with any kind of drag-nets or lines, shall exhibit, from some part of the vessel where they can be best seen, two lights. One of these lights shall be red and the other shall be white. The red light shall be above the white light, and shall be at a vertical distance from it of not less than six feet and not more than twelve feet; and the horizontal distance between them, if any, shall not be more than ten feet. These two lights shall be of such a character and contained in lanterns of such construction as to be visible all around the horizon, the white light a distance of not less than three miles and the red light of not less than two miles.

(d) Rafts, or other water craft not herein provided for, navigating by hand power, horse power, or by the current of the river, shall carry one or more good white lights, which shall be placed in such manner as shall be prescribed by the Board of Supervising Inspectors of Steam Vessels.*

Art. 10. A vessel which is being overtaken by another, except a steam-vessel with an after range-light showing all around the horizon, shall show from her stern to such last-mentioned vessel a white light or flare-up light.

Art. 11. A vessel under one hundred and fifty feet in length when at anchor shall carry forward, where it can best be seen, but at a height not exceeding twenty feet above the hull, a white light, in a lantern so constructed as to show a clear, uniform, and unbroken light visible all around the horizon at a distance of at least one mile.

A vessel of one hundred and fifty feet or upwards in length when at anchor shall carry in the forward part of the vessel, at a height of not less than twenty and not exceeding forty feet above the hull, one such light, and at or near the stern of the vessel, and at such a height that it shall be not less than fifteen feet lower than the forward light, another such light.

The length of a vessel shall be deemed to be the length appearing in her certificate of registry.

Art. 12. Every vessel may, if necessary, in order to attract attention, in addition to the lights which she is by these rules required to carry, show a flare-up light or use any detonating signal that cannot be mistaken for a distress signal.

Art. 13. Nothing in these rules shall interfere with the operation of any special rules made by the Government of any nation with respect to additional station and signal lights for two or more ships of war or for vessels sailing under convoy, or with the exhibition of recognition signals adopted by shipowners, which have been authorized by their respective Governments, and duly registered and published.

Art. 14. A steam-vessel proceeding under sail only, but having her funnel up, may carry in daytime, forward, where it can best be seen, one black ball or shape two feet in diameter.

SOUND SIGNALS FOR FOG, AND SO FORTH.

Art. 15. All signals prescribed by this article for vessels under way shall be given:

1. By "steam-vessels" on the whistle or siren.
2. By "sailing-vessels" and "vessels towed" on the fog horn.

The words "prolonged blast" used in this article shall mean a blast of from four to six seconds duration.

A steam-vessel shall be provided with an efficient whistle or siren, sounded by steam or

*Resolved, That all coal boats, trading boats, produce boats, canal boats, oyster boats, fishing boats, and other water craft navigating any bay, harbor, or river, propelled by hand power, horse power, sail or by the current of the river, or which shall be moored in or near the channel or fairway of any bay, harbor, or river, shall carry one bright white light forward, not less than six feet above the rail or deck.

Rafts of one crib and not more than two in length shall carry one bright white light on a pole not less than twelve feet high; three or more cribs in length shall carry one white light at each end of the raft at the same height. Boom rafts with cross binders towed ahead of steamers on the Mississippi and Ohio rivers, and other waters flowing into the Gulf of Mexico, and on the Red River of the North, shall carry a white light four feet high at the forward end of the raft, and one such light at each side midway between the forward and the after end.

Rafts of more than one crib abreast shall carry one white light on each outside corner of the raft, making four lights in all. Bag or boom rafts navigating or anchored in the fairway of any bay, harbor, or river shall carry a white light at least twelve feet high at each end of the raft, and one of such lights on each side midway between the forward and after end.

Rowboats shall carry one white light two feet above the stem.

JAS. A. DUMONT,
Supervising Inspector-General,
President Board of Supervising Inspectors.
Approved, February 8, 1899.
L. J. Gage, Secretary.

by some substitute for steam, so placed that the sound may not be intercepted by any obstruction, and with an efficient fog horn; also with an efficient bell. A sailing-vessel of twenty tons gross tonnage or upward shall be provided with a similar fog horn and bell.

In fog, mist, falling snow, or heavy rainstorms, whether by day or night, the signals described in this article shall be used as follows, namely:

(a) A steam-vessel under way shall sound, at intervals of not more than one minute, a prolonged blast.

(c) A sailing-vessel under way shall sound, at intervals of not more than one minute, when on the starboard tack, one blast; when on the port tack, two blasts in succession, and when with the wind abaft the beam, three blasts in succession.

(d) A vessel when at anchor shall, at intervals of not more than one minute, ring the bell rapidly for about five seconds.

(e) A steam-vessel when towing, shall, instead of the signals prescribed in sub-division (a) of this article, at intervals of not more than one minute, sound three blasts in succession, namely, one prolonged blast followed by two short blasts. A vessel towed may give this signal, and she shall not give any other.

(f) All rafts or other water craft, not herein provided for, navigating by hand power, horse power, or by the current of the river, shall sound a blast of the fog horn, or equivalent signal, at intervals of not more than one minute.

SPEED OF SHIPS TO BE MODERATE IN FOG, AND SO FORTH.

Art. 16. Every vessel shall, in a fog, mist, falling snow, or heavy rainstorms, go at a moderate speed, having careful regard to the existing circumstances and conditions.

A steam-vessel hearing, apparently forward of her beam, the fog signal of a vessel the position of which is not ascertained shall, so far as the circumstances of the case admit, stop her engines, and then navigate with caution until danger of collision is over.

STEERING AND SAILING RULES—PRELIMINARY—RISK OF COLLISION.

Risk of collision can, when circumstances permit, be ascertained by carefully watching the compass bearing of an approaching vessel. If the bearing does not appreciably change, such risk should be deemed to exist.

Art. 17. When two sailing-vessels are approaching one another, so as to involve risk of collision, one of them shall keep out of the way of the other as follows, namely:

(a) A vessel which is running free shall keep out of the way of a vessel which is close hauled.

(b) A vessel which is close hauled on the port tack shall keep out of the way of a vessel which is close hauled on the starboard tack.

(c) When both are running free, with the wind on different sides, the vessel which has the wind on the port side shall keep out of the way of the other.

(d) When both are running free, with the wind on the same side, the vessel which is to the windward shall keep out of the way of the vessel which is to the leeward.

(e) A vessel which has the wind aft shall keep out of the way of the other vessel.

Art. 18. Rule I. When steam-vessels are approaching each other head and head, that is, end on, or nearly so, it shall be the duty of each to pass on the port side of the other; and either vessel shall give, as a signal of her intention, one short and distinct blast of her whistle, which the other vessel shall answer promptly by a similar blast of her whistle and thereupon such vessels shall pass on the port side of each other. But if the courses of such vessels are so far on the starboard of each other as not to be considered as meeting head and head, either vessel shall immediately give two short and distinct blasts of her whistle, which the other vessel shall answer promptly by two similar blasts of her whistle, and they shall pass on the starboard side of each other.

The foregoing only applies to cases where vessels are meeting end on or nearly end on, in such a manner as to involve risk of collision; in other words, to cases in which, by day, each vessel sees the masts of the other in a line, or nearly in a line, with her own, and by night to cases in which each vessel is in such a position as to see both the side-lights of the other.

It does not apply by day to cases in which a vessel sees another ahead crossing her own course, or by night to cases where the red light of one vessel is opposed to the red light of the other, or where the green light of one vessel is opposed to the green light of the other, or where a red light without a green light or a green light without a red light, is seen ahead, or where both green and red lights are seen anywhere but ahead.

RULE III. If, when steam-vessels are approaching each other, either vessel fails to understand the course or intention of the other, from any cause, the vessel so in doubt shall immediately signify the same by giving several short and rapid blasts, not less than four, of the steam-whistle.

RULE V. Whenever a steam-vessel is nearing a short bend or curve in the channel, where,

from the height of the banks or other cause, a steam-vessel approaching from the opposite direction can not be seen for a distance of half a mile, such steam-vessel, when she shall have arrived within half a mile of such curve or bend, shall give a signal by one long blast of the steam whistle, which signal shall be answered by a similar blast, given by any approaching steam-vessel that may be within hearing. Should such signal be so answered by a steam-vessel upon the farther side of such bend, then the usual signals for meeting and passing shall immediately be given and answered; but, if the first alarm signal of such vessel be not answered, she is to consider the channel clear and govern herself accordingly.

When steam-vessels are moved from their docks or berths, and other boats are liable to pass from any direction toward them, they shall give the same signal as in the case of vessels meeting at a bend, but immediately after clearing the berths so as to be fully in sight they shall be governed by the steering and sailing rules.

RULE VIII. When steam-vessels are running in the same direction, and the vessel which is astern shall desire to pass on the right or starboard hand of the vessel ahead, she shall give one short blast of the steam whistle, as a signal of such desire, and if the vessel ahead answers with one blast, she shall put her helm to port; or if she shall desire to pass on the left or port side of the vessel ahead, she shall give two short blasts of the steam-whistle as a signal of such desire, and if the vessel ahead answers with two blasts, shall put her helm to starboard; or if the vessel ahead does not think it safe for the vessel astern to attempt to pass at that point, she shall immediately signify the same by giving several short and rapid blasts of the steam-whistle, not less than four, and under no circumstances shall the vessel astern attempt to pass the vessel ahead until such time as they have reached a point where it can be safely done, when said vessel ahead shall signify her willingness by blowing the proper signals. The vessel ahead shall in no case attempt to cross the bow or crowd upon the course of the passing vessel.

RULE IX. The whistle signals provided in the rules under this article, for steam-vessels meeting, passing, or overtaking, are never to be used except when steamers are in sight of each other, and the course and position of each can be determined in the daytime by a sight of the vessel itself, or by night by seeing its signal lights. In fog, mist, falling snow or heavy rainstorms, when vessels can not so see each other, fog-signals only must be given.

Art. 19. When two steam-vessels are crossing, so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way of the other.

Art. 20. When a steam-vessel and a sailing-vessel are proceeding in such directions as to involve risk of collision, the steam-vessel shall keep out of the way of the sailing-vessel.

Art. 21. Where, by any of these rules, one of the two vessels is to keep out of the way, the other shall keep her course and speed.

Art. 22. Every vessel which is directed by these rules to keep out of the way of another vessel shall, if the circumstances of the case admit, avoid crossing ahead of the other.

Art. 23. Every steam-vessel which is directed by these rules to keep out of the way of another vessel shall, on approaching her, if necessary, slacken her speed or stop or reverse.

Art. 24. Notwithstanding anything contained in these rules every vessel, overtaking any other, shall keep out of the way of the overtaken vessel.

Every vessel coming up with another vessel from any direction more than two points abaft her beam, that is, in such a position, with reference to the vessel which she is overtaking that at night she would be unable to see either of that vessel's side-lights, shall be deemed to be an overtaking vessel; and no subsequent alteration of the bearing between the two vessels shall make the overtaking vessel a crossing vessel within the meaning of these rules, or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.

As by day the overtaking vessel can not always know with certainty whether she is forward of or abaft this direction from the other vessel she should, if in doubt, assume that she is an overtaking vessel and keep out of the way.

Art. 25. In narrow channels every steam-vessel shall, when it is safe and practicable, keep to that side of the fair-way or mid-channel which lies on the starboard side of such vessel.

Art. 26. Sailing-vessels under way shall keep out of the way of sailing-vessels or boats fishing with nets, or lines, or trawls. This rule shall not give to any vessel or boat engaged in fishing the right of obstructing a fair-way used by vessels other than fishing-vessels or boats.

Art. 27. In obeying and construing these rules due regard shall be had to all dangers of navigation and collision, and to any special circumstances which may render a departure from the above rules necessary in order to avoid immediate danger.

SOUND SIGNALS FOR VESSELS IN SIGHT OF ONE ANOTHER.

Art. 28. When vessels are in sight of one another, a steam-vessel under way whose engines are going at full speed astern shall indicate that fact by three short blasts on the whistle.

NO VESSEL UNDER ANY CIRCUMSTANCES TO NEGLECT PROPER PRECAUTIONS.

Art. 29. Nothing in these rules shall exonerate any vessel, or the owner or master or crew thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper lookout, or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

Art. 30. The exhibition of any light on board of a vessel of war of the United States or a revenue cutter may be suspended whenever, in the opinion of the Secretary of the Navy, the commander in chief of a squadron, or the commander of a vessel acting singly, the special character of the service may require it.

DISTRESS SIGNALS.

Art. 31. When a vessel is in distress and requires the assistance from other vessels or from the shore the following shall be the signals to be used or displayed by her, either together or separately, namely:

IN THE DAYTIME.

A continuous sounding with any fog-signal apparatus, or firing a gun.

AT NIGHT.

First. Flames on the vessel as from a burning tar barrel, oil barrel, and so forth.

Second. A continuous sounding with any fog-signal apparatus, or firing a gun.

Sec. 2. That the supervising inspectors of steam-vessels and the Supervising Inspector-General shall establish such rules to be observed by steam-vessels in passing each other and as to the lights to be carried by ferry-boats and by barges and canal-boats when in tow of steam-vessels, not inconsistent with the provisions of this Act, as they from time to time may deem necessary for safety, which rules when approved by the Secretary of Commerce and Labor* are hereby declared special rules duly made by local authority, as provided for in article thirty of chapter eight hundred and two of the laws of eighteen hundred and ninety. Two printed copies of such rules shall be furnished to such ferry-boats and steam-vessels, which rules shall be kept posted up in conspicuous places in such vessels.

Sec. 3. That every pilot, engineer, mate, or master of any steam-vessel, and every master or mate of any barge or canal-boat, who neglects or refuses to observe the provisions of this Act, or the regulations established in pursuance of the preceding section, shall be liable to a penalty of fifty dollars, and for all damages sustained by any passenger in his person or baggage by such neglect or refusal: Provided, That nothing herein shall relieve any vessel, owner or corporation from any liability incurred by reason of such neglect or refusal.

Sec. 4. That every vessel that shall be navigated without complying with the provisions of this Act shall be liable to a penalty of two hundred dollars, one half to go to the informer, for which sum the vessel so navigated shall be liable and may be seized and proceeded against by action in any district court of the United States having jurisdiction of the offense.

Sec. 5. That sections forty-two hundred and thirty-three and forty-four hundred and twelve (with the regulations made in pursuance thereof, except the rules and regulations for the government of pilots of steamers navigating the Red River of the North and rivers emptying into the Gulf of Mexico and their tributaries, and except the rules for the Great Lakes and their connecting and tributary waters as far east as Montreal), and forty-four hundred and thirteen of the Revised Statutes of the United States, and chapter two hundred and two of the laws of eighteen hundred and ninety-three, and sections one and three of chapter one hundred and two of the laws of eighteen hundred and ninety-five, and sections five, twelve, and thirteen of the Act approved March third, eighteen hundred and ninety-seven, entitled "An Act to amend the laws relating to navigation," and all amendments thereto, are hereby repealed so far as the harbors, rivers, and inland waters aforesaid (except the Great Lakes and their connecting and tributary waters as far east as Montreal, and the Red River of the North, and rivers emptying into the Gulf of Mexico, and their tributaries) are concerned.

Sec. 6. That this act shall take effect four months from the date of its approval.

Approved, June 7, 1897.

BOUNDARY LINES OF THE HIGH SEAS AS DEFINED IN DEPARTMENT CIRCULAR DATED FEBRUARY 9, 1897.

Pursuant to section 2 of the act approved February 19, 1895, the following lines dividing

*As amended by act of Congress approved February 14, 1903, establishing the Department of Commerce and Labor.

the high seas from rivers, harbors, and inland waters are hereby designated and defined:

(All bearings are magnetic and given approximately.)

New York Harbor.—From Navesink (southerly) light-house NE. ⅝ E., easterly, to Scotland light-vessel; thence NNE. ½ E. through Gedney Channel whistling buoy to Rockaway Point life-saving Station.

Baltimore Harbor and Chesapeake Bay.—From Cape Henry light-house NE. by E. ¾ E., easterly, to outer entrance whistling buoy; thence N. by E. ⅜ E. to Cape Charles light-house.

Galveston Harbor.—From Galveston Bar whistling buoy N. by W. ¾ W. through the beacon marking the outer extremity of the N. jetty, and SW. by W. ½ W., westerly, through North Breaker beacon.

Boston Harbor.—From Point Allerton NNE. ¼ E., easterly, through Point Allerton beacon to Northeast Grave whistling buoy; thence NNE. ¼ E. to Outer Breaker (Great Pig Rocks) bell buoy; thence NE. by E. ⅜ E. to Halfway Rock Beacon; thence NE. by E. ¼ E. to Eastern Point light-house.

San Francisco Harbor.—From Point Bonita light-house SE. ⅞ S. to Point Lobos.

Philadelphia Harbor and Delaware Bay.—From Cape Henlopen light-house NE. by E. to South Shoal whistling buoy; thence NNE. ¼ E. to Cape May light-house.

Charleston Harbor.—From Charleston light-vessel NW. ½ W. (toward Sullivans Island range rear light) to the North Jetty, and from Charleston light-vessel SW. ⅛ W. to Charleston whistling buoy; thence SW. ⅞ W. to Charleston Main channel entrance bell buoy; thence W. to Folly Island.

Savannah Harbor and Calibogue Sound.—From Tybee whistling buoy NNW. 15-16 W. through North Slue Channel outer Buoy to Braddock Point, Hilton Head Island, and from Tybee whistling buoy W. to Tybee Island.

St. Simon Sound (Brunswick Harbor) and St. Andrew Sound.—From hotel on beach of St. Simon Island 15-16 miles NE. by E. ¼ E. from St. Simon light-house, SE. ⅞ E. to St. Simon sea buoy; thence S. ¼ E. to St. Andrew Sound sea buoy; thence W. to the shore of Little Cumberland Island.

Pensacola Harbor.—From Pensacola entrance whistling buoy N. ⅞ W., a tangent to the E. side of Fort Pickens, to the shore of Santa Rosa Island, and from the whistling buoy NW. 3-16 W. to Fort McRee range front light.

Mobile Harbor and Bay.—From Mobile Bay outer or deep sea whistling buoy (or its watch buoy in summer) NE. by N. to the shore of Mobile Point, and from the whistling buoy NW. by W. to the shore of Dauphin Island.

New Orleans Harbor and the Delta of the Mississippi.—From South Pass East Jetty light-house N. by E. ½ E. to Pass a Loutre light-house; thence N. to Errol Island and from South Pass East Jetty light-house W. ⅞ S. to Southwest Pass light-house; thence N. to shore.

San Diego Harbor.—From Point Loma light-house S. ⅞ E. to San Diego Bay outside bar whistling buoy; thence NNE. ⅞ E. to tower of Coronado Hotel.

Columbia River Entrance.—From Cape Disappointment light-house SE. ⅞ E. to Point Adams light-house.

Cutler (Little River) Harbor, Me.—A line drawn from Long Point SW. by W. ¾ W. to Little River Head.

Little Machias Bay, Machias Bay, Englishman Bay, Chandler Bay, Moosebec Beach, Pleasant Bay, Narraguagus Bay, and Pigeon Hill Bay, Me.—A line drawn from Little River head WSW. ¼ W. to the outer side of Old Man; thence WSW. ⅜ W. to the outer side of Double Shot Islands; thence W. ¾ S. to Libby Islands light-house; thence WSW. ¼ W. to Moose Peak light-house; thence WSW. ¼ W. to Little Pond Head; from Pond Point, Great Wass Island, W. by S. to outer side of Crumple Island; thence W. ⅜ S. to Petit Manan light-house.

All Harbors on the Coasts of Maine, New Hampshire, and Massachusetts between Petit Manan Light-House, Me., and Cape Ann Light-Houses, Mass.—A line drawn from Petit Manan light-house SW. ⅜ S., 26½ miles to Mount Desert light-house; thence W. ⅜ S., 33½ miles to Matinicus Rock light-houses; thence WNW. ⅞ W., 20 Miles, to Monhegan Island light-house; thence W., 21 miles to Seguin Island whistling buoy; thence W. ¾ S., 19 miles, to Old Anthony whistling buoy, off Cape Elizabeth; thence SW., 28 miles, to Boon Island light-house; thence SW. ⅛ W., 12 miles, to Anderson Ledge Spindle, off Isles of Shoals light-house; thence S. by W. ¼ W., 19½ miles, to Cape Ann light-houses, Mass. (Lines heretofore established for Portland Harbor, and Kittery Harbor, Me., Portsmouth Harbor, N. H., Newburyport, Ipswich, and Annisquam Harbors, Mass., are hereby cancelled.)

All Harbors in Cape Cod Bay, Mass.—A line drawn from Plymouth (Gurnet) light-houses E., 16¼ miles, to Race Point light-house.

Nantucket Sound, Vineyard Sound, Buzzards Bay, Narragansett Bay, Block Island Sound, and Easterly Entrance to Long Island Sound.—A line drawn from Chatham light-houses, Mass., S. by E. ⅜ E., about 6 miles, to Northeast Slue Channel whistling buoy (Pollock Rip); thence S. by W. ⅝ W., about 11 miles, to Great Round

Shoal light-vessel; thence SSW. 5/8 W., 7 5/8 miles, to Sankaty Head light-house; from the westerly end of Tuckernuck Island NW. by W. ½ W., about 5½ miles, to Wasque Point, Chappaquiddick Island; from Gay Head light-house W. ¾ S., 35 miles, to Block Island (SE.) light-house, thence W. ¾ S., 15 miles, to Montauk Point Light-House, on the easterly end of Long Island, N. Y.

St. Johns River, Florida.—A straight line from the outer end of the northerly jetty to the outer end of the southerly jetty.

(Additions to these lines will be made from time to time.)

RESOLUTIONS OF THE BOARD OF SUPERVISING INSPECTORS OF STEAM VESSELS, ADOPTED AT THEIR ANNUAL MEETING OF JANUARY, 1898.

Be it resolved, That section 8, Rule IX, page 68, Rules and Regulations, 1897, be amended by adding thereto an additional paragraph as follows:

It shall be the duty of all inspectors before granting an original license or renewing an existing one to a master or pilot of steam-vessels for any waters, to satisfy themselves by an examination in writing that such officers are thoroughly familiar with the pilot rules upon the waters for which they are licensed.

Be it further resolved, That each master and pilot of steam-vessels, wherever employed, shall, when receiving his license (either original or renewal), be furnished with a pamphlet copy of the Rules and Regulations governing pilots, and of the statutes upon which such rules are founded applicable to the waters on which their licenses are intended to be used, as stated in the body thereof.

M. J. GALVIN,
GEO. H. STARBUCK,
W. H. MURDAUGH,
Committee.

Attest:
JAS. A. DUMONT,
Supervising Inspector-General.

Approved February 11, 1898.
O. L. SPAULDING,
Acting Secretary of the Treasury.

The Board of Supervising Inspectors, at their annual meeting of January, 1900, adopted the following resolution relating to the use of search lights:

Resolved. That Masters, mates, and pilots of all vessels be required to exercise due caution in the use of their search lights so as not to throw the rays of the light into the pilot house of passing steamers.

BEST TESTIMONIALS. HIGHEST MEDALS.

South Brooklyn, February 16, 1891.

Harry Louderbough, Esq.,
New Jersey Paint Works, Jersey City, N. J.

Dear Sir.—Replying to yours, will say that we have used your Copper and Seam Paints, and same have given entire satisfaction.

Yours respectfully, TRUNDY & MURPHY.

Port Clyde, Me., May 24, 1890.

Mr. H. Louderbough.

Dear Sir.—What New Jersey Copper Paint we have used at our Railway at Port Clyde has greatly pleased us, it is so easy to apply, being finely ground, and it leaves a nice bottom. We are thoroughly convinced it is a superior Paint.

Yours respectfully,
WASHBURN MARINE RY. CO.

North Tisbury, Mass., March 26, 1900.

Mr. H. Louderbough.

Dear Sir.—I have just had an experience that to my mind bears out fully your claims that "New Jersey" Copper Paint does protect a vessel's bottom. My yacht was sunk for about a year, when the mast worked loose and came to the top of the water, being held by the rigging. It was owing to this that I located her. She was lifted and the bottom, painted with "New Jersey" Copper Paint, was in splendid condition, while the remaining frame and woodwork was honeycombed by the salt water worm and ruined. My former experiences with your Copper Paint, giving a smooth and good sailing bottom, added to this last experience, makes me a great champion for your paint, I shall always give it the preference over all others. Yours respectfully,
OTIS B. LUCE.

Jersey City, July 11, 1890.

Mr. H. Louderbough.

Dear Sir.—At Gokey's Dry Dock to-day I lifted schooner "Thomas L. James," which was painted a year ago with New Jersey Copper Paint. She was as clean as the day she was painted, and I consider your Paint to be the best I have ever used.

Yours, &c., D. N. PEARCE.

Hampton, Va., Oct. 2, 1901.

Mr. H. Louderbough.

My Dear Sir.—At my Railways, I have used for two seasons, your Wetterstedt Copper Paint, and have found it, next to your "New Jersey" Copper Paint, a very satisfactory Paint, being smooth, making a good sailing bottom, and easy to apply.

Yours truly, WARREN HALL.

THE REPUTATION OF OUR GOODS IS OUR BIGGEST ASSET

Table of Pilotage.

As established by an Act of the Legislature of the State of New York, passed April 3d, 1884.

*From April 1st to November 1st.

Feet and Inches.	Inward.		Outward.	
	Rate.	Pilotage.	Rate.	Pilotage.
6.	$2 73	$ 16.68	$2.02	$ 12.12
6.6	"	18.07	"	13.13
7.	"	19.46	"	14.14
7.6	"	20.85	"	15.15
8.	"	22 24	"	16.16
8.6	"	24.63	"	17.17
9.	"	25.02	"	18.18
9.6	"	26.41	"	19.19
10.	"	27.80	"	20.20
10.6	"	29.19	"	21.21
11.	"	30.58	"	22.22
11.6	"	31.97	"	23.23
12.	"	33.36	"	24.24
12.6	"	34.75	"	25.25
13.	"	36.14	"	26.26
13.6	"	37.54	"	27.27
14.	3.38	47.32	2.33	32.62
14.6	"	49.01	"	33.78
15.	"	50 70	"	34.95
15 6	"	52.39	"	36.11
16.	"	54.08	"	37.28
16.6	"	55.77	"	38.44
17.	"	57.46	"	39.61
17.6	"	59.15	"	40.77
18.	4.13	74.34	3.08	55.44
18.6	"	76.40	"	56.98
19.	"	78.47	"	58.52
19.6	"	80.53	"	60.06
20.	"	82.60	"	61.60
20.6	"	84 66	"	63.14
21.	4.88	102.48	3.56	74.76
21.6	"	104.92	"	76.54
22.	"	107.36	"	78.32
22.6	"	109.80	"	80.10
23.	"	112.24	"	81.88
23.6	"	114.68	"	83.66
24.	"	117.12	"	85.44
24 6	"	119.56	"	87.22
25.	"	122.00	"	89.00
25.6	"	124.44	"	90.78
26.	"	126.88	"	92.56
26.6	"	129.32	"	94.34
27.	"	131.76	"	96.12
27.6	"	134.20	"	97.90
28.	"	136.64	"	99.68
28.6	"	139 08	"	101.46
29.	"	141.52	"	103.24
29.6	"	143.96	"	105.02
30.	"	146.40	"	106.80
30.6	"	148.84	"	108.58
31.	"	151.28	"	110.36
31.6	"	153.72	"	112.14
32.	"	156.16	"	113.92
32.6	"	158.60	"	115.70
33.	"	161.04	"	117.48
33.6	"	163.48	"	119.26
34.	"	165.92	"	121.04
34.6	"	168.36	"	122.82
35.	"	170.80	"	124.60

Vessels boarded so far south or east that Sandy Hook light-vessel cannot be seen from deck in day time and clear weather, one quarter extra.

TRANSPORTATION NORTH TO EAST RIVER, AND VICE VERSA, $5.00.

Hauling to or from Wharf, $3.00.

Detention, $3.00 per day.

PILOTAGE FOR TAKING VESSELS FROM UPPER TO LOWER QUARANTINE.

For vessels having had death or sickness on board, double Outward Pilotage.

For vessels from sickly ports, but having had no sickness on board, single Outward Pilotage.

Pilotage of vessels from Quarantine to New York, Quarter Pilotage.

INTERMEDIATE PILOTAGE.

From New York to Perth Amboy and vice versa, $1.50 per foot.

From Sea to Perth Amboy, 2-3 to Bar Pilot, 1-3 to Perth Amboy Pilot.

From North or East River to Bayonne or vice versa, $10.00 each way.

WINTER PILOTAGE.

*From November 1st to April 1st, inclusive, $4.00 to be added to each Pilotage.

RATES OF HELL GATE PILOTAGE.

All Sloops and Schooners at Riker's Island, $1.00 per foot draft.

All Sloops and Schooners at Sand's Point, $1.50 per foot draft.

All Sloops and Schooners, Winter Pilotage, $1.00 additional on gross amount.

All Square Rigged Vessels at Riker's Island, $1.25 per foot draft.

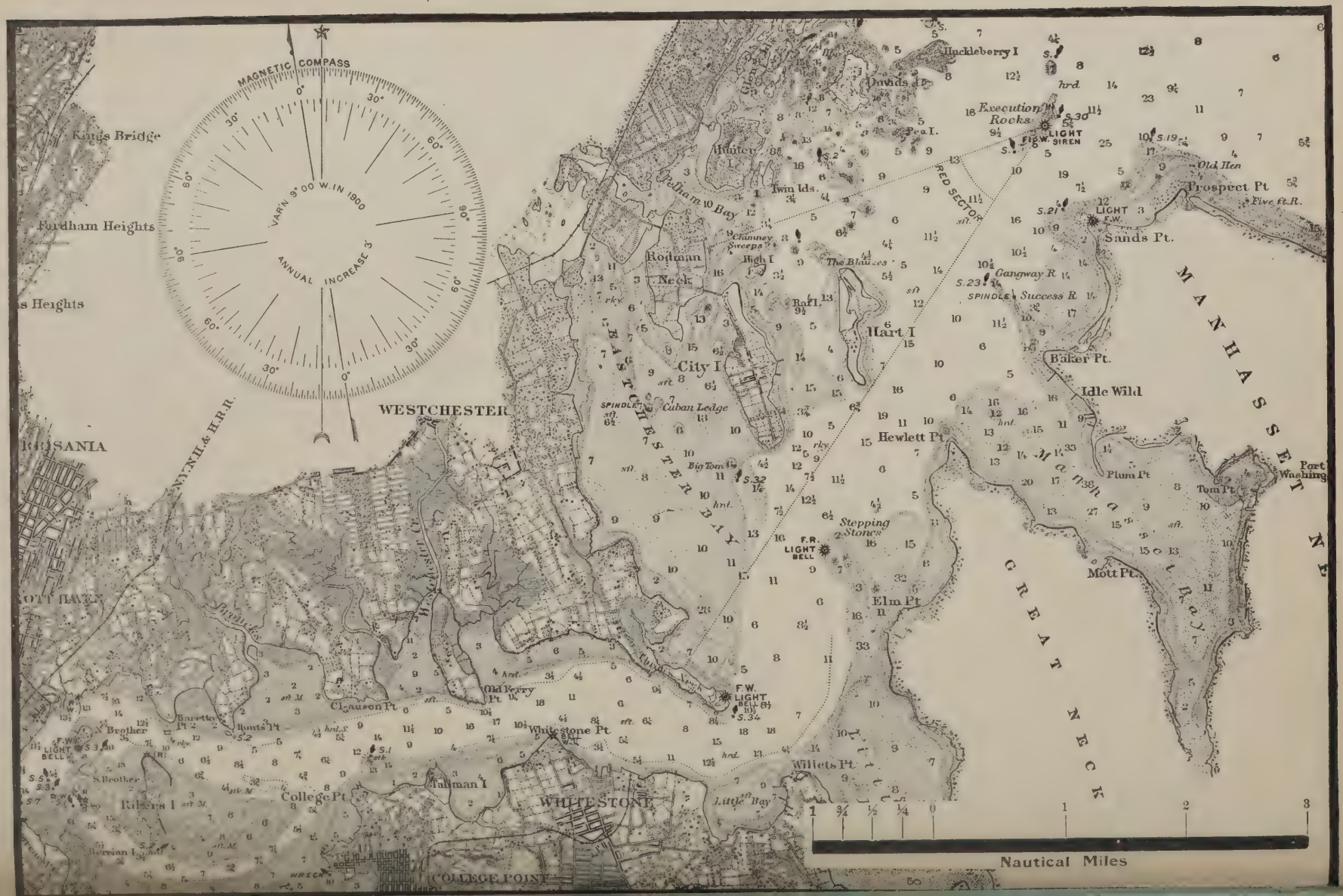
All Square Rigged Vessels at Sand's Point, $1.75 per foot draft.

All Square Rigged Vessels, Winter Pilotage, $2.00 additional on gross amount.

The Greatest of Advertisements.

OUR CHECKER BOARDS AND CHECKERS
MEMORANDUM BOOKS AND MATCH SCRATCHERS

All productions of merit are well advertised. This can be said of "NEW JERSEY" MARINE PAINTS.



PART OF LONG ISLAND SOUND, N. Y., FROM EXECUTION ROCKS TO COLLEGE POINT.

Rates of Pilotage, Delaware Bay and River.

DRAFT, FEET.	INWARD. If spoken outside of a straight line Southward and Eastward of Fenwicks Island Lighthouse to Five-fathom Bank Light-ship, and Northward and Eastward from Five-fathom Bank Light-ship to Hereford Lighthouse.	If spoken inside a straight line Southward and Eastward of Fenwicks Island Lighthouse to Five-fathom Bank Light-ship, and Northward and Eastward from Five-fathom Bank Light-ship to Hereford Lighthouse, and outside of a straight line drawn from Cape Henlopen Light to Cape May Light.	If not spoken until inside of line drawn from Cape May Light to Cape Henlopen Light	OUTWARD.
8	32.88	29.92	26.96	29.92
8½	34.94	31.79	28.65	31.79
9	36.99	33.66	30.33	33.66
9½	39.05	35.53	32.00	35.53
10	41.10	37.40	33.70	37.40
10½	43.15	39.27	35.38	39.27
11	45.21	41.14	37.07	41.14
11½	47.27	43.01	38.75	43.01
12	49.32	44 88	40.44	44.88
12½	61.87	56.25	50.63	56.25
13	64.35	58.50	52.65	58.50
13½	66.82	60.75	54.68	60.75
14	69.30	63 00	56.70	63.00
14½	71.77	65.25	58.73	65.25
15	74.25	67.50	60.75	67.50
15½	76.72	69.75	62.78	69.75
16	79.20	72.00	64.80	72.00
16½	81.67	74.25	66.83	74.25
17	84 15	76.50	68.85	76 50
17½	86.62	78 75	70.88	78.75
18	89.10	81.00	72.90	81.00
18½	91.57	83.25	74.93	83.25
19	94.05	85.50	76.95	85.50
19½	96.52	87.75	78.98	87.75
20	99.00	90.00	81.00	90.00
20½	101.47	92.25	83.03	92.25
21	103.95	94 50	85.05	94.50
21½	106.42	96 75	87.08	96.75
22	108.90	99.00	89.10	99.00
22½	111.37	101.25	91.13	101.25
23	113 85	103.50	93.15	103.50
23½	116.32	105.75	95.18	105.75
24	118.80	108.00	97.20	108.00
24½	121.27	110.25	99.23	110.25
25	123.75	112.50	101.25	112.50
25½	126.22	114.75	103.28	114.75
26	128.70	117.00	105.30	117.00
26½	131.17	119 25	107.33	119.25
27	133.65	121.50	109.35	121.50

Rates for vessels calling at Delaware Breakwater for orders: Inward or outward, one-half the amount set opposite the draft in one of the columns above headed inward, the column depending on where the vessel is spoken by a pilot.

Crisfield, Md., Oct. 1, 1901.

Mr. H. Louderbough.

Dear Sir.—At our Railways, for several years, we have sold and applied your Copper Paint and used it in connection with many other copper paints, and can cheerfully give it our endorsement for its good qualities, it having given our customers and ourselves good satisfaction. Yours truly,

McCREADY & NELSON.

Greenport, L. I., February 19, 1891.

Mr. H. Louderbough.

Dear Sir.—Having applied the New Jersey Red Copper for yachts, I do not hesitate to say it is a very superior Paint for yachts' bottoms, being very smooth. It is so finely ground, it makes a good sailing bottom. I remain, yours, &c.,

FRED. C. BEEBE.

Why is it

"New Jersey" Copper Paint

Is so very popular?

It is Because:

It is made from best materials, carefully prepared. Being finely ground, it produces a good sailing bottom and does not contain any coarse dross, and when once thoroughly stirred and mixed does not need constant stirring to keep it from setting, and its success is largely obtained from the fact that it is easy to apply, flowing freely, not dragging or working tough under the brush.

All these good qualities have brought the NEW JERSEY COPPER PAINT to the front among all competitors.

One trial will convince you the above qualities can be found in this paint. We simply ask a trial, knowing its virtues will take care of it under all trying circumstances.

H. LOUDERBOUGH, Prop.,

New Jersey Paint Works.

ALSO MANUFACTURER OF

"New Jersey" Elastic Seam Paint

"New Jersey" Yacht Black
Ready mixed and in paste form

"New Jersey" Yacht White
Ready mixed for use

"New Jersey" Red Copper Paint
For Yachts

"New Jersey" Anti-Corrosive and Anti-Fouling Paints
For Iron Vessels

"Wetterstedt" Copper Paint

Norfolk, Va., May 2, 1892.

Mr. H. Louderbough.

Dear Sir.—In the use of your Yacht Copper for yachts, in my trade at the Railway, those that use it once use it again, they all being pleased with it. Smoothest and brightest in color, making a very pretty bottom and improving generally the appearance of the boats that use it. L. C. JONES.

Explanation of Storm Warnings.

Warnings of the approach of windstorms will be published by the display of flags by day and lanterns by night, in connection with the bulletins posted and the reports furnished to newspapers, mariners, and others interested.

The warnings adopted by the U. S. Weather Bureau for announcing the approach of windstorms are as follows:

The **Storm Warning** (a red flag, eight feet square, with black center, three feet square) indicates that a storm of marked violence is expected.

The **Red Pennant** (eight feet hoist and fifteen feet fly) displayed with the flags, indicates easterly winds, that is, from the northeast to south, inclusive, and that the storm center is approaching.

The **White Pennant** (eight feet hoist and fifteen feet fly) displayed with the flags, indicates westerly winds, that is, from north to southwest, inclusive, and that the storm center has passed.

When the **Red Pennant** is hoisted above the Storm Warning, winds are expected from the *northeast quadrant;* when below, from the *southeast quadrant.*

When the **White Pennant** is hoisted above the Storm Warning, winds are expected from the *northwest quadrant;* when below, from the *southwest quadrant.*

Night Storm Warnings —By night a *red light* will indicate *easterly winds;* a *white* above a *red light* will indicate *westerly winds.*

The **Information Warnings** have been discontinued at all storm-warning display stations, and such advices as were previously given in information orders will be furnished hereafter in advisory messages.

The **Hurricane Warning** (two storm-warning flags, red with black centers, displayed one above the other) indicates the expected approach of a tropical hurricane or of an extremely severe and dangerous storm.

No night Hurricane Warnings are displayed.

NOTE.—The attention of captains is invited to the fact that at most regular Weather Bureau stations, by application to the Weather Bureau official, they may have their barometers compared. This service will always be rendered without compensation.

Perth Amboy, N. J., Nov. 15, 1901.

Mr. Harry Louderbough.

Dear Sir.—A proof of a good thing is in its use, and we feel that we can give your New Jersey Marine Paints a good endorsement; having been shipmates with them for many years, and large users of your Marine Paints, gives us confidence in giving them our hearty endorsement. Yours truly,

RARITAN DRY DOCK CO.

Bagdad, Fla., Nov. 1, 1901.

Mr. Harry Louderbough.

Dear Sir.—For eleven years I have been in touch with your "New Jersey" Copper Paint, using no others, and I desire to express to you my entire satisfaction; it has proved itself to be the most reliable ever used, showing clean even in the bad fouling waters of Florida.

Yours truly, GEO. BRUCE.

Boston, February, 26, 1891.

Harry Louderbough, Esq., Prop. New Jersey Paint Works, Jersey City. N. J.

Dear Sir.—We beg to state that the New Jersey Copper Paint is giving our customers splendid satisfaction. We are having a steady trade for this article, which is on the increase. This speaks for itself.

Yours truly, DeLONG & SEAMAN.

Norfolk, Va., Sept. 25, 1901.

Mr. Harry Louderbough.

Dear Sir.—The demand for "New Jersey" Copper Paint is so very great in this market that we carry no other kind, and all this Paint's success has been obtained in a few years against the older brands which, at one time, had the control of this market.

Yours truly, JENKINS PAINT & OIL CO.

Baltimore, Oct. 10, 1901.

Mr. H. Louderbough.

Dear Sir.—I have sold and handled your New Jersey Copper Paint for some eleven years, and I can cheerfully recommend it, for it has proven itself to be the best Copper Paint I have ever sold; it is smooth, making a fine sailing bottom, and keeps remarkably clean, even in the bad fouling waters of our bay. Yours respectfully,

J. H. HOLTHAUS, JR.

Jersey City, N. J., Nov. 8, 1901.

Mr. Harry Louderbough.

Dear Sir.—We have used at our Dry Dock your "New Jersey" Perfect Ship Black, and find it far superior to any other Paint we have ever used. It is the blackest black Paint made, dries quickly, and does not grow gray or dull as many others do.

Yours truly, BURT & MITCHELL CO.

The Sailing Ship and the Panama Canal.

By James Page, U. S. Hydrographic Office.

In the minds of a majority of those whose lives have been spent in the interior, and to a certain though less widespread extent among those whose daily vocation has brought them in touch with the sea, the opinion is current, always expressed in a tone of regret, that the value of the wind as a motive power in transportation by water is no longer worthy of study, and that the sailing ship as a factor in commerce is shortly to take its place on the shelves of the museum of antiquities beside the Roman trireme. No such apprehension need exist. Of the net tonnage of the world quoted in Lloyd's summary for the year 1903-'04, amounting to 23,282,000 tons all told, 6,466,000 tons, or in the neighborhood of 28 per cent., is still credited to sailing vessels, the number of bottoms being 17,761 and 12,182, steam and sail respectively.

THE UNITED STATES SECOND IN SAILING TONNAGE.

With regard to flag, the United States, the most progressive among nations in the application of machinery, strange to say, stands high in the list in the relative proportion of sail to steam. For this country the figures given are 1,390,000 tons sail and 1,566,000 tons steam, respectively, America, in the absolute amount of sailing tonnage, standing far in advance of all other nations, with the single exception of Great Britain, and in the relative amount, as compared with steam, in advance of all save two, Italy and Norway, in both of which latter the total amount of sailing tonnage still exceeds that of steam.

An explanation of the erroneous impression which exists as to the importance of sailing tonnage may be found in the fact that it is in a majority of cases derived from a casual inspection of the merchant fleets in the northern harbors of the Atlantic seaboard—Boston, New York, Philadelphia, and Baltimore—ports in which the passenger and express traffic exercises a preponderating influence. Here, indeed, the eye will often seek, and seek in vain, amid the series of smoke-begrimed funnels and uncouth hulls which line the docks, for the taut rigging, the trim spars, and the graceful lines of the clipper ship. In the more southerly Atlantic ports and along the Pacific coast the sailer is a more frequent visitor. In the fiscal year 1901-'02, according to the report of the Bureau of Statistics upon the foreign trade of the United States, the total number of vessels entering the port of New York from abroad was 4,127, with a total tonnage of 8,893,000. Of this number, 974, embracing 484,000 tons, were sailing vessels—i. e., 24 per cent. of the whole number of entries, carrying but 5 per cent. of the whole tonnage. In the port of Pensacola, on the other hand, one of the most active in the Gulf district, the aggregate number of entries was 344, the total tonnage amounting to 428,000. Of this number, 180 were sailing vessels, carrying 140,000 tons—i. e., 52 per cent. of the total number of vessels, carrying 33 per cent. of the total tonnage.

On the Pacific coast the same general features obtain, although here the contrast between express and freight ports is by no means so marked. The returns for the same year show for the port of San Francisco 580 entries, with a total tonnage of 1,016,000. Of this 269 were sailing vessels, with a capacity of 436,000 tons, the number of sailing entries thus amounting to 47 per cent. of the whole, carrying 43 per cent. of the total tonnage. Going north to Portland, however, where the freight traffic (lumber and grain) alone is important, the number of entries is 129, with a total tonnage of 236,000, distributed between 25 steamers and 104 sailing ships, the tonnage of these latter amounting to 177,000, or 75 per cent. of the whole.

For the several seaboard districts of the United States the figures for the fiscal year 1901-'02 in their entirety are as follows:

	No. of entries.	Per cent.	Tonnage.	Per. cent.
Atlantic:				
Total	11,187	100	17,145,000	100
Steam	7,296	64	15,822,000	92
Sail	3,891	36	1,323,000	8
Gulf:				
Total	3,478	100	3,956,000	100
Steam	2,340	67	3,389,000	86
Sail	1,138	33	567,000	14
Pacific:				
Total	3,864	100	3,261,000	100
Steam	2,909	75	2,205,000	68
Sail	955	25	1,056,000	32

THE PACIFIC THE CRUISING GROUND OF THE MODERN SAILER.

A fact worthy of note is established by a comparison of the figures here given for the Atlantic and the Pacific coasts. On the former the total freight landed in the country from foreign ports by sail amounted to 1,323,000 tons, the number of cargoes being 3,981. The average cargo was thus in the neighborhood of 350 tons. On the Pacific coast the freight brought by sail amounted to 1,056,000 tons, the cargoes, however, numbering but 955, or on the average about 1,100 tons. In other words, the average tonnage of the sailing vessel on the Atlantic is but one-

third of that on the Pacific. The fact is significant as going to show that the latter ocean is at present, and is likely to remain for many years to come, the cruising ground of the modern sailing ship, the growth of which during the last two or three decades has been considerable, although not so startling as that of her younger but gigantic sister, the modern steamer.

FAMOUS AMERICAN CLIPPERS.

The American clippers which astonished the world by their wonderful performances in the 50's—the Flying Cloud, which made the voyage from New York to San Francisco in 84 days; the Northern Light, which made the return voyage in 77 days; the Sovereign of the Seas, which left New York Saturday, June 18, and anchored in the harbor of Liverpool July 1, 1852, having sailed across the Atlantic in less than 14 days—were not large vessels, as measured by present-day standards, the first two being less than 2,000 tons burthen, the last less than 2,500 tons. Even as late as 1880 the list of merchant shipping of the United States mentions but 19 sailing vessels of a tonnage greater than 2,000, while at the present time sailing ships of 3,000 tons and upward are not exceptional, the limit for the time being having been reached for fore-and-aft rig in the seven-masted steel schooner, Thomas W. Lawson, 5,008 tons, built at Quincy, Mass., and for square rig in the five-masted steel bark Preussen, 5,081 tons, built in 1902 for the Laeisz shipping agency of Hamburg.

The achievements of this vessel, the largest of her class, in the matter of speed, as also those of her sister ship, the Potosi, have excited much interest, not only as evincing superior construction and masterly handling, but also in view of the support they lend to the belief that the sailing ship has not yet attained those dimensions attended by maximum speed. The most remarkable performance of the Preussen thus far has been the completion of the voyage from the Channel to Iquique, Chile, a distance of 12,000 miles, in 57 days—about the time made by the steam freighters engaged in the South American trade. On this voyage the vessel took her departure from Ouessant March 5, 1903, and crossed the line March 18, thirteen days out, establishing a record never before equaled by a sailing ship. The parallel of 50° S. in the Atlantic was attained April 10, and in the Pacific April 21, eleven days being thus spent in weathering that most tempestuous of regions, Cape Horn. From noon of April 23 to noon of April 24 the vessel laid down 368 miles to her credit, this being the best day's run throughout the voyage. The anchor was dropped in the harbor of Iquique May 1, fifty-seven days from point of departure to destination.

Prime among the factors which are to exercise an influence over the relative use of sail and steam in navigation is the question of the cost of fuel, and the proportion of the steamer's carrying capacity, which must be devoted to its transportation. Given ports of departure and destination not too remote from each other, and coal cheap at both ends of the line, the sailing ship has but little chance of survival. In longer voyages, say those of 6,000 miles and upward, the space which must be allotted to fuel in the case of the steamer becomes considerable, and may cut down the cargo-carrying capacity to such a degree as to seriously interfere with the profits of the voyage. Coaling stations remedy this evil to some extent; but at these coal is always expensive, rising at some points to as much as $15 per ton, while their frequent use, furthermore, is liable to unduly protract the voyage in point of both distance and time. In the event of the successful application of low-grade petroleum for use as fuel at sea, many of these difficulties will of course disappear.

TIME SAVED BY A KNOWLEDGE OF THE METEOROLOGY OF THE SEA.

A factor by no means generally recognized, but of vast importance to profitable navigation by sail, is the better knowledge which we are gradually acquiring of the meteorology and physical geography of the sea. The era of record passages is closed, and sailing ships are no longer urged to their utmost speed in the hope of outstripping a rival, even at the sacrifice of cost and safety. As a consequence, the study of the winds and currents of the sea has not the vital interest which it possessed in the days of Maury, when the relative performance of the Sea Witch, the Dreadnought, the Invincible, the Oriental, and other like fancifully named craft was a matter of international discussion. The investigation has, however, gone earnestly forward, and the sailing ship has reaped the benefit in the shape of greater security, quicker passages, and larger profits. First among the national institutions interested in this work is the Deutsche Seewarte, having its central office in Hamburg, Germany, and a single instance will serve to show the practical value of the results which have been accomplished in this direction. The exportation of saltpeter from the nitrate ports along the west coast of South America to Europe is handled exclusively by German sailing ships, and the best sailing route from the English Channel to the coast of Chile and return has since the inception of this trade been made the subject of special investigation by the Seewarte.

As a result of this study the time of passage has steadily diminished. During the early 70's, the epoch at which the trade first became active, the voyage from the Lizard to Valparaiso occupied over 100 days. Careful discussion of the material meanwhile accumulated, leading not so much to change in the route as to more intelligent handling of the vessel by the shipmaster under given meteorological conditions, has succeeded in reducing this time materially, the successive steps of the improvement being as follows:

1876-1880, 18 passages; average time, 102 days.
1881-1884, 38 passages; average time, 91 days.
1885-1888, 64 passages; average time, 88 days.
1889-1892, 82 passages; average time, 83 days.

With this much said in support of the claim that navigation by sail is still a factor in freight transportation, fulfilling in the case of a long voyage a sphere for which the steamer is ill-adapted; that it even has a future of increased usefulness before it, and that its interests must be considered in any broad scheme whose aim is the promotion of the world's commerce, the question of the value of the proposed inter-oceanic canal from the point of view of the sailing ship is worthy of consideration.

Although not so unfortunately situated in this respect as the Suez Canal, where the Red Sea, with its strong monsoon winds, numerous shoals, and intricate passages, interposes an insuperable obstacle to navigation by sail, the neighborhood of the proposed American canal is by no means free from difficulty. The whole isthmus from Tehuantepec eastward to Colombia lies within the tropics, and the climate exhibits the characteristic tropical feature to a marked degree. The year is divided into two seasons, the wet and the dry, the former lasting from May to December, the latter from January to April. In the vicinity of Colon (latitude 9° 22′ N., longitude 79° 55′ W.), the Atlantic terminal of the canal, and of Panama (latitude 8° 55′ N., longitude 79° 31′ W.), the Pacific terminal, the average annual rainfall amounts to 125 inches and to 47 inches respectively, distributed throughout the several months as follows:

	Colon.	Panama.
January	1.9 in.	0.5 in.
February	1.5 "	0.0 "
March	1.3 "	0.2 "
April	2.7 "	0.9 "
May	11.6 "	5.3 "
June	13.9 "	5.2 "
July	14.3 "	4.5 "
August	14.9 "	5.7 "
September	12.6 "	7.3 "
October	13.8 "	6.9 "
November	23.6 "	5.6 "
December	12.2 "	4.8 "
	124.3	46.9

At both places the average monthly temperature is 79° Fahrenheit, the variation from month to month being insignificant. The extreme temperatures are 68° and 95′ Fahrenheit. The relative humidity is of course excessive, ranging from 90 per cent. during the early forenoon hours to 75 per cent. during the afternoon.

THE WINDS OF THE ATLANTIC END OF THE CANAL.

With regard to that feature of the weather most essential to navigation by sail, viz., the winds, the northeast trades blow home to the Caribbean coast throughout practically the entire year. They attain their greatest force and their most northerly direction during the dry season (January-April), and it is during these months that along the eastern coast of Central America the dreaded "northers" occur—storms which give so little warning of their approach and blow with such dangerous violence that steamers calling at Colon are invariably required to keep up steam in order that they may be able to slip their cables and put to sea at a moment's notice. As the wet season advances the trades weaken in force, at the same time inclining to southeast; and at its height, during August and September, brief periods of southwesterly winds occur, these, however, being no longer the northeast trades of the Atlantic, but the prolongation of the southeast trades of the Pacific, which, reaching across the equator into northern latitudes, are converted by the earth's rotation into southwesterly winds and at intervals attain sufficient force to traverse the isthmus.

A sailing vessel approaching the coast from the eastward will thus experience but little difficulty on the score of wind. Once within the chain of islands enclosing the Caribbean Sea, a straight course may in general be shaped for the entrance to the canal, and the trades, although light in force during a large portion of the year, will serve to bear her to the desired haven. Currents also will assist, for throughout the entire sea, except in the immediate neighborhood of the coast of Cuba on the north, and of Venezuela and Colombia on the south, the motion of the surface water is to the westward.

The log of a sailing vessel emerging from the eastern terminus of the canal into the Caribbean will tell a different story, the conditions which facilitated to such a degree the approach toward the port of Colon serving in like measure to embarrass departure from it. To steer a direct course in the face of the trades will be impossible, and no matter what her ultimate destination, the square rigger will find it necessary to

seek an outlet from the Caribbean Sea by way of the Yucatan Channel and thence through the straits of Florida into the Atlantic.

In the case of vessels bound to a European or an American port such a route will not involve any very great sacrifice of distance. For those destined to points below the equator—for example, the fleet engaged in the lumber trade from Puget Sound to South Africa, one of the most important lines of traffic still monopolized by the sailing vessel—the detour, necessitating as it does the attainment of the parallel of 35 degrees in the North Atlantic in order to circumnavigate the northeast trades, will be out of the question, and these will continue to make the passage by way of Cape Horn.

As to the feasibility of the route from Colon to the straits of Florida, it may be stated that during the wet season the passage will offer but little difficulty, the trades at this time being light in force and blowing from a point well to the eastward, or even south of east. During the dry season, however, different and decidedly adverse conditions prevail. From November to April the trades along the coast are northerly or even northwesterly in direction, and frequently attain the force of a fresh gale, requiring a close-hauled ship to reduce her canvas to reefed topsails and courses. Under these circumstances the voyage resolves itself into a steady beat to windward under most trying circumstances.

Owing to the fact that the sailing traffic of the region is at present confined to fore-and-aft schooners, it is impossible to state with accuracy the delay which a vessel of large tonnage making the passage from Colon to Cape San Antonio during the winter months would thus suffer. An analogous situation exists, however, in the case of the passage up the China Sea at the time of the northeast monsoon, and the reluctance with which this latter feat is attempted by sailing masters may be gathered from the fact that during the prevalence of this monsoon the bulk of east Asiatic trade from Europe and America follows the sailing route leading to the southward and eastward of Australia, the majority of captains claiming that such a circuit results in a saving of time over the China Sea route, although it involves the running down of at least 3,000 miles additional distance.

BELT OF CALMS AT THE PACIFIC END OF THE CANAL.

At the eastern extremity of the canal the difficulties which a sailing vessel may expect to encounter will thus arise from a superabundance of wind rather than a lack of it. At the western extremity, on the other hand, these conditions will be completely reversed. Upon emerging from the canal into the Pacific Ocean a vessel will enter an extensive belt of calms and light airs, which render navigation by sail more tedious than in any other frequented portion of the sea.

In order to understand the feebleness of the winds throughout this region, a word is necessary as to the agency by which winds are produced. Wind is air in motion, the direction of the motion being always from an area throughout which the atmospheric pressure is high toward an area throughout which it is low, the strength of the wind at any point being within certain limits proportional to the barometric gradient or slope at that point. Where these gradients are steep the winds are strong; where they are gentle the winds are light; where they are absent, or, in other words, where the barometric pressure is uniform, the force giving rise to the winds vanishes and the air is accordingly at rest.

It is such a uniformity of pressure that exists throughout the region under consideration. Under normal conditions the distribution of atmospheric pressure over the earth's surface consists of two extra-tropical belts of high pressure, separated by an equatorial belt of low pressure, each of these three belts completely encircling the globe. On the equatorial slope of the high-pressure belts there is a steady movement of the air toward the low-pressure trough which separates them, this movement constituting in the northern hemisphere the northeast trades, in the southern hemisphere the southeast trades respectively. Between these two, coinciding roughly with the bottom of the trough which separates the high-pressure belts, lies a region known among seamen as the "Doldrums," characterized by moist, cloudy weather, absence of wind, and abundance of rain. The width of this region varies—at some points wide, at others narrow. In that portion of the North Pacific included between the American coast and the meridian of 120° W. it reaches a maximum, extending in latitude from a point one or two degrees north of the equator to Cape Lucas, the southern extremity of Lower California. Throughout this whole region the barometric pressure is below the average and extremely uniform, ranging from 29.85 inches during the northern summer to 29.95 inches during the northern winter. Here, accordingly, barometric gradients are absent, the winds sink to stagnation, and calms prevail.

A knowledge of the general character of the winds of this region may be gathered from the following diagrams, the first holding for the northern summer (May-October) and the second

for the northern winter. The figures in the center of each five-degree square show the percentage of the time (number of hours in each hundred) during which calms or light variable airs may be expected to prevail, the length of the arrow in each quadrant, the percentage of the whole time during which the wind may be expected to blow from some point in that quadrant. The figures in the lower left hand corner give for each square the total number of observations considered. No attempt is made to show the average force of the wind, but it may in general be stated that for the entire area it does not exceed 3 on the Beaufort scale, corresponding to a velocity of 15 miles per hour, and capable of imparting to a full-rigged ship sailing "full and by" a speed of from 3 to 4 knots.

THE MEXICAN BELT OF CALMS.

From an inspection of these diagrams it is evident that the "Mexican Belt of Calms," as it is known among seamen, is triangular in shape, the base of the triangle lying far out in the Pacific, its longitude roughly coinciding with the meridian 125° W., near the fairway of vessels bound from San Francisco to the line. In latitude, the position of the vertex, as well as the axis of the belt, or line along which the maximum frequency of calms occurs, changes slightly with the season. From November to April its mean position is between 5° and 10° N. As the summer advances and the sun moves northward, however, the axis of the belt likewise recedes from the equator, its average position for the months May-October lying between 10°-15° north. The frequency of calms increases rapidly as the coast is approached. Immediately under the coast, however, a diminution may in some instances be noted, due to the presence of the land and sea breezes, and also to the fact that at certain points the trade wind of the Caribbean seems to reach across the Isthmus.

TIME SAVED FOR SAILING VESSELS BY THE PANAMA CANAL.

As to the saving of time likely to be effected by the substitution of the canal for the present route around the Horn, the figures are to some extent disappointing. The length of the voyage from the Channel to San Francisco by way of Cape Horn, following the sailing route laid down by the Deutsche Seewarte, is in the neighborhood of 16,000 miles. The average sailing time is 139 days. The return voyage, although 1,000 miles greater in distance, is made in less time, occupying but 132 days, the delay on the outward-bound passage being occasioned by the difficulty of beating around the Cape. As evidence of the importance of the traffic following this route, it may be stated that, during the year 1901-1902, 104 sailing vessels from the Channel entered at the Pacific coast ports of the United States alone, and 322 vessels cleared from these ports for the Channel.

The average sailing time from the Channel to Colon is 43 days, and from Panama to San Francisco 52 days. Allowing two days for passage through the canal, the duration of the voyage by the Isthmian route will thus amount to 97 days, as compared with 139 days by way of Cape Horn, or a net saving of 42 days. The substitution of any other Pacific coast port for San Francisco will serve to increase or diminish the duration of both voyages to a like extent, the average sailing time to San Diego being three days less than to San Francisco, the average sailing time to Portland and Puget Sound respectively five days and seven days greater.

On the return voyage the saving in time is likely to prove considerably less. The average duration of the passage from San Francisco to Panama, as derived from the very few instances obtainable, is 55 days, while the voyage from Colon to the Channel, owing to the circuitous route which a sailing vessel is obliged to follow, occupies, under ordinary conditions, 60 days. Again adding the two days required to cross the Isthmus, the duration of the voyage from San Francisco to the Channel by way of the canal will thus prove to be 117 days, giving a saving of 15 days as compared with the voyage by way of the Horn.

The coastwise trade between the Atlantic and the Pacific seaboard of the United States, so profitable prior to the construction of the transcontinental railways, has almost vanished from the sea, the traffic in coal alone surviving. Whether it can be revived by throwing the canal open to sailing vessels of small tonnage, coasting schooners, and the like, is a problem. The saving of time in this instance would be considerable, the duration of the voyage between New York and San Francisco by way of Cape Horn amounting to practically the same thing as the voyage from the Channel, viz., 140 days outward and 130 days homeward, while the passage from New York to Colon may be made in 20 days and the return in 28 days, giving for the total sailing time from New York to San Francisco via the canal 74 days, and for the return 85 days, which means a saving of 66 days and 45 days respectively.—"Nautical Gazette."

Sailing Directions from New York to Key West.

All bearings and courses are magnetic. Distances are expressed in nautical miles.

From Scotland Light Ship, steer S. ½ W. for 5½ miles or until the Navesink light houses bear N. W. Then steer S. by W. ¼ W. for 36¼ miles, when Barnegat light house should be abeam, distant 4¾ miles. The bell buoy off the inlet should be nearly in range with the light house and distant about 2 miles. At this point the depth is eleven fathoms.

From this position eastward of Barnegat, the course to Diamond Shoal Light Ship is S. by W. ¾ W. for 135 miles, then change course to S. by W. ⅜ W. and run 153 miles. The light ship should then be close on the starboard beam.

In case the light ship for any reason is not on her station, soundings should be obtained and in no case should the ship go in less than 17 or 18 fathoms. Inside of this depth, the soundings are very unreliable and irregular. If intending to take the inside course, the current may be avoided by keeping the ship between the depths of 18 and 21 fathoms until Cape Hatteras light house bears N. W.

INSIDE COURSE.

From Diamond Shoal Ship, steer S. W. ⅜ W. for 153 miles. Frying Pan Shoal Light Ship should then be abeam, distant 14 miles and depth about 16 fathoms. From this point run S. W. ¾ W. for 147 miles to latitude 32° 00′ N. and longitude 80° 00′ W. From this point run S. by W. ¼ W. for 87 miles to latitude 30° 36′ N. and longitude 80° 23′ W. and depth about 20 or 21 fathoms. Then change course to S. ½ E. and run 218 miles, when Jupiter Inlet light house should be abeam, distance about 2½ miles, depth about 12 fathoms. After running 126 miles on this course, Cape Canaveral light house should be abeam, distant about 19 miles and depth about 15 fathoms. After running about 90 miles on this course, soundings should be obtained frequently as there are a number of dangerous shoals to the northward and eastward of Cape Canaveral light.

OUTSIDE COURSE.

From Diamond Shoal Light Ship, run S. ¾ W. for 108 miles to latitude 33° 18′ N., and longitude 75° 32′ W. Then change course to S. W. by S. ⅜ S. for 185 miles to latitude 30° 33′ N., and longitude 77° 14′ W. From this point, the course S. W. ¾ S. and distance 248 miles will put the ship about 5 miles off the land, depth about 13 fathoms and about 14 miles to the northward of Jupiter Inlet light house. From this position, the course is S. ¼ E. distance 14 miles and Jupiter Inlet light house should be abeam, distant about 2 miles, depth 12 fathoms. This course is to be taken when Matanilla Shoal cannot be made in the daytime. If Matanilla Shoal can be made in the daytime, it should be run for. The course being S. W. by S. ⅜ S. and the distance 333 miles from the position in latitude 33° 18′ N. and longitude 75° 32′ W. This course and distance will put the ship about 4 miles N. by E. ½ E. from the shoal. Then steer S. W. by W. ½ W. for 56 miles. The ship should then be about 2 miles off Jupiter Inlet light house, and depth about 12 fathoms Some care must be exercised to avoid the wreck about 3¼ miles E. S. E. from Jupiter Inlet light house. Then change course to S. ¼ E. for 9½ miles and Lake Worth Inlet will be abeam, distant 1¼ miles, depth about 13 fathoms.

From the position about 1¼ miles eastward of Lake Worth Inlet, run S. ⅛ W. for 72½ miles and Fowey Rocks light house should be abeam, distant 1 mile. In running this distance, the lead, rather than the compass, should be relied on. Soundings should be obtained very frequently and the ship kept between the depths of 9 and 11 fathoms, or as near 10 fathoms as possible, and by so doing very little or no current will be encountered.

To the northward of Fowey Rocks light house there are a number of very dangerous shoals, which the western edge of the northern red sector in Fowey Rocks light house cuts. This line is also marked by north end of Florida Reefs Beacon, distant 9¼ miles, N. ¼ W. from Fowey Rocks light house.

From the position about 1¼ miles eastward of Fowey Rocks light house, steer S. ¼ W. for 11⅛ miles. Then change course to S. S. W. ⅛ W. for 12¼ miles, when Carysfort Reef light house should be abeam, distant 1 mile. From this position run S. S. W. ⅜ W. for 16½ miles. Then change course to S. W. ⅞ W. for 16¼ miles, when Alligator Reef light house should be abeam, distant 2¼ miles. Continue on this same course for 14¼ miles, and then change course to W. by S. ¾ S. for 16¼ miles and Sombrero Key light house should be abeam, distant 1 mile. Continue on this same course for 15 miles. Then steer W. by S. ½ S. for 8¼ miles and American Shoal light house should be abeam, distant 1⅜ miles. Continue on this same course for 10½ miles. Then change course to N. W. ¼ N. and steer for Key West light house. This course corresponds with the edge of a red sector in the light house. After running nearly 6 miles on this course, Sand Key light will change to white. Then run W. ⅞ N. for 2¼ miles or until Key West light house bears N. E. ¼ N. Then change course to N. by E. ¼ E. which leads into the harbor.

HAWK CHANNEL, CAPE FLORIDA TO KEY WEST.

There is 11 feet at low water in this channel. High water, full and change: At Cape Florida, 8.30 a.m.; at Key West, 9.30 a.m.

Sailing Directions.—Standing to the Southward after leaving Biscayne Shoal Buoy, when Cape Florida (discontinued) Light-House bears SSW. head for it until North end of Virginia Key (Norris Cut) bears West and Fowey Rocks Light-Station S. ⅝ E. This will leave North end of Florida Reefs Beacon W. ¾ of a mile ESE. ⅜ E. Change course to South and follow tabulated directions below.

From	Side on which to leave it.	Distance at which to pass it.	Depth of water.	Course to make good.	Distance from aid to aid	Least water between aids.	To
			feet		miles	feet	
Beacon W (down at present)..	Port.....	¾ mile...	14	South	3⅜	21	First P. S. Buoy Leading to Hawk Channel.
First P. S. Buoy leading to Hawk Channel.	Either.....	Close to.	21	South	3⅜	18	Biscayne Channel P. S. Buoy.
Biscayne Channel P. S. Buoy.	Either.....	Close to	21	South	2¾	17	Beacon V.
Beacon V	Port.....	900 feet..	14	S. by W. 5-16 W.	¼	18	Soldier Key P. S. Buoy.
Soldier Key P. S. Buoy.....	Starboard	1,500 feet.	19	S. by W. 5-16 W ..	2⅛	15	Ragged Keys Buoy, No. 2.
Ragged Keys Buoy, No. 2....	Starboard.	Close to.	17	S. by W. 5-16 W...	2¼	17	Bowles Bank Beacon Light, B. B.
Bowles Bank Beacon Light, B. B.	Port.....	750 feet..	15	S. by W. 5-16 W...	1	12	Bowles Bank Buoy, No. 4.
Bowles Bank Buoy, No. 4....	Starboard	Close to.	11	S. by W. 5-16 W...	1½	11	} Bache Shoal Beacon, B. S. { Off Bache Shoal and south of Bowles Bank Beacon.
Bache Shoal Beacon, B. S....	Port.....	1,650 feet.	16	S. by W. 5-16 W...	2½	14	} Margot Fish Shoal Beacon, M. F.
Off Bache Shoal and south of Bowles Bank Beacon.	Starboard.	1,200 feet.	15	S. by W. 5-16 W...	2½	13	
Margot Fish Shoal Beacon, M. F.	Starboard.	900 feet..	12	S. by W. 5-16 W...	1 5 16	13	Off Elliott Key, P. S. Buoy.
Off Elliott Key P. S. Buoy..	Either.....	Close to.	13	S. by W. 5-16 W...	2½	12	Caesar Creek Bank Buoy, No. 6.
Caesar Creek Bank Buoy, No 6	Starboard.	Close to.	12	S. by W. 5-16 W...	2½	12	Old Rhodes Bank Beacon, O. R.
Old Rhodes Bank Beacon, O. R.	Starboard.	1,200 feet.	12	SSW. ⅞ W.....	4⅞	14	Off Key Largo, P. S. Buoy.
Off Key Largo P. S. Buoy...	Starboard.	600 feet..	13	SSW. ⅞ W.....	4⅜	11	Basin Hill Beacon, B. H.
Basin Hill Beacon, B. H.	Port.....	Close to.	11	SSW. ¾ W....	5	11	Grecian Shoal Buoy, No. 5.
Grecian Shoal Buoy, No. 5..	Port.....	⅞ mile...	15	SSW. ¾ W.....	5	12	Mosquito Bank Beacon Light, M. B.
Mosquito Bank Beacon Light, M. B.	Port.....	½ mile...	12	SW. ⅜ S.....	5¼	11	Triangles Beacon, T.
Triangles Beacon, T.....	Port.....	$\frac{3}{16}$ mile..	15	SW. ⅜ S.....	6¾	12	Hen and Chickens Beacon Light, H. C.
Hen and Chickens Beacon Light, H. C.	Starboard.	800 feet..	16	SW. 15-16 W	6½	11	Alligator Shoal Buoy, No. 11.
Alligator Shoal Buoy, No. 11.	Port.....	¾ mile...	14	SW. 15-16 W	⅛	13	Indian Key Beacon.
Indian Key Beacon.....	Starboard.	¼ mile...	11	SW. 15-16 W	9	14	Long Key Shoal Buoy, No. 12.
Long Key Shoal Buoy, No. 12.	Starboard.	¼ mile...	12	SW. by W. 9-16 W.	5¼	15	Duck Key, P. S. Buoy.
Duck Key P. S. Buoy.....	Either.....	Close to.	25	SW. by W. 9-16 W.	3⅜	17	East Turtle Shoal Beacon Light, E. T.
East Turtle Shoal Beacon Light, E. T.	Port.....	600 feet..	18	SW. by W. 9-16 W.	2½	25	West Turtle Shoal H. S. Buoy.
West Turtle Shoal H. S. Buoy.	Port.....	⅝ mile...	16	SW. by W. 9-16 W.	3⅛	24	Jacobs Harbor Heads Beacon, J. H. H.
Jacobs Harbor Heads Beacon, J. H. H.	Starboard.	1,200 feet.	21	WSW. 5-16 W.....	2¼	25	East Washerwoman Shoal Beacon Light, E. W.
East Washerwoman Shoal Beacon Light, E. W.	Port.....	⅜ mile...	15	WSW. 5-16 W.....	4¼	21	P. S. buoy off Pigeon Key Bank.
P. S. buoy off Pigeon Key Bank.	Either.....	Close to	23	WSW. 9-16 W.....	7	25	P. S. buoy off Bahia Honda Key.
P. S. buoy off Bahia Honda Key.	Either....	Close to.	26	WSW. 11-16 W....	10¼	19	Loggerhead Key Beacon, L. K.
Loggerhead Key Beacon, L.K.	Starboard.	⅜ mile..	20	WSW. 11-16 W....	6⅜	15	Four-Foot Shoal Beacon, D. H. (Delaware Heads.)
Four-Foot Shoal Beacon, D. H.	Port.....	¾ mile...	24	WSW. 11-16 W....	1⅜	21	West Washerwoman Shoal Buoy, No. 17.
West Washerwoman Shoal Buoy, No. 17.	Port.....	⅜ mile...	18	WSW. 11-16 W....	1¾	16	Pelican Key Beacon Light, P. K.
Pelican Key Beacon Light, P. K.	Port.....	750 feet...	12	WSW. 11-16 W....	8¾	23	Hawk Channel Turn, P. S. Buoy.
Hawk Channel Turn P. S. Buoy.	Either....	Close to.	33	WNW. ⅞ W.....	2⅛	30	Whitehead Point Spit Buoy, No. 6.
Whitehead Point Spit Buoy, No. 6.	Starboard.	600 feet...	30	North	¾	27	South End of Middle Ground Buoy, N. 11.
South End of Middle Ground Buoy, No. 11.	Port.....	300 feet...	17	NNE	¾	25	Wharves at Key West, Fla.

The depths of water given are for mean low water. The mean rise and fall of tides is 1½ feet. The flood tides sets inshore, the ebb tide sets offshore. Where changes in the course are given in the above directions, they should be made with the proper aid abeam, on the side and at the distance directed. Vessels of less than 11 feet draft may, if necessary, pass close to any aid in the channel. There are no rocks in this channel, and anchorages are good and numerous. The channel is ¼ mile wide at the narrowest point, and vessels of less than 11 feet draft have room to beat through it.

Don't Neglect the Lead.

The Allan liner Grecian, which went ashore at Sandwich Point, outside Halifax Harbor, was a total loss. The inquiry into the disaster has resulted in the dismissal of the pilot from the association and the suspension of the captain's certificate for three months.

The board of inquiry found the disaster to be due to the failure to use the lead. The night was squally, but not continuously blustery, and no very strong wind was blowing nor heavy seas running. There seems to have been no reason why the vessel was not brought safely into port, other than the culpability of the officers in charge to diligently cast the lead. The board overruled the contention that the captain's responsibility ceases when the pilot comes on board, but held that he is equally responsible with the pilot in bringing the vessel safely to land. Therefore, it is incumbent upon him to use every precaution in navigating his ship the same as he would be expected to do had he no pilot on board.

The inquiry brings out forcibly the need of a frequent and intelligent use of the lead, a matter which too many navigators are prone to neglect. Even within recent years, two big steamers and one sailing vessel have gone ashore on the south side of Long Island within a few miles of each other, where the soundings are as regular in increasing depth from the beach to deep water as a ship railway; yet in neither of these cases has there been any mention made of close attention to the lead. Volumes have been written, underwriters have urged, and shipowners have begged that the lead receive the attention due to it, but all to no avail with a certain class of mariners who are seldom found out until they have caused serious loss in property and too often in lives.

"New Jersey" Copper Paint Labels in Seven Foreign Languages.

BACK LABEL IN ITALIAN.

"NEW JERSEY"

Un Fatto Remarcabile.

QUESTE intaglio he una copia di una fotografia di una tavola havendo una punta pittato colla **"NEW JERSEY" COPPER PITTURA,** manufatturata di Harry Louderbough, praprietario dei LAVORI DI PITTURA DI "NEW JERSEY," Jersey City, N. J., e posta nell' acqua a Porto Royal, S. C., per cinque mesi. Sopra la punta non pittata potete vedere le rovini del verme di acqua salata cosi destruttive al legno, e pure il gran numero di crocchioli che sono attaccate sopra. Osserva la punta pittata, dove la **"New Jersey" Copper Pittura** fu usata, le suoi splendide condizione.

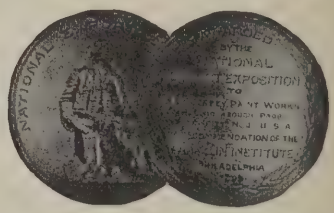
La tavola qui representata fu posta nell' acqua a Porto Royal, S. C., di me e lasciata nell' acqua per cinque mesi. La punta pittata era buona come quando fu posta nell' acqua.

MILLS EDWARD,
Maestro di Scuna "Florence Shay."

MARCA DE FABRICA.
REGISTRADA IN EUROPA.

"NEW JERSEY"
Copper Pittura.

COPPER PITTURA



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- Vascella Nera,
- Vascella Bianca,
- Pittura d'Aberi Vascelle
- Pittura di Fumajuolo,
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La Fera del Americano Instituto di New York ne ha premiato colla piu alta ottenevole Medeglia per la nostra "New Jersey" Copper Pittura, Siim Pittura e Pile Preservativa Pittura.

NEW JERSEY PAINT WORKS,
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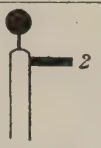
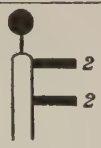
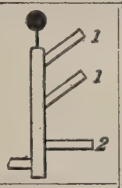
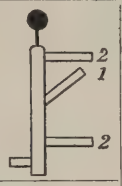
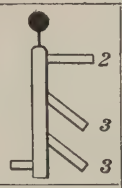
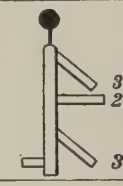
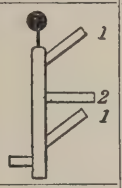
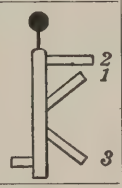
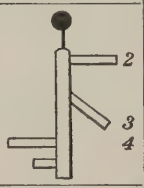
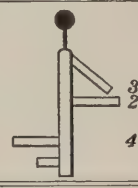
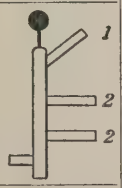
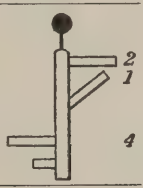
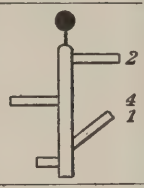
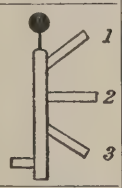
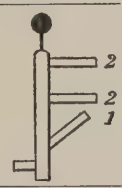
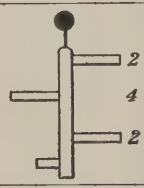
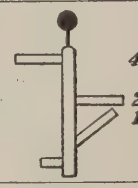
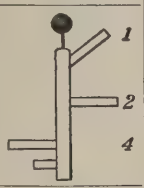
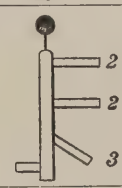
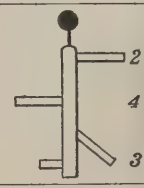
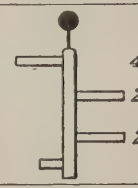
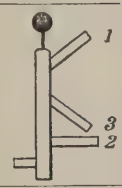
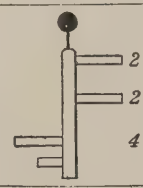
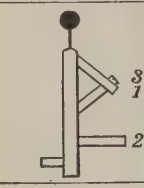
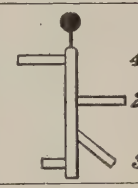
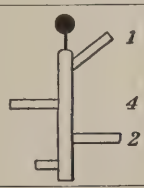
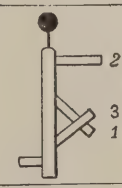
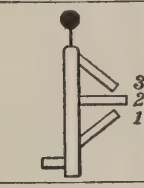
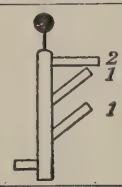
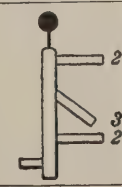
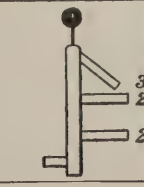
GENERAL ALPHABETICAL TABLE FOR MAKING THE INTERNATIONAL CODE SIGNALS BY MEANS OF DISTANT SIGNALS BY FIXED SEMAPHORE.

"PREPARATIVE," "ANSWERING," or "STOP" after each complete signal.



ANNUL THE WHOLE SIGNAL.

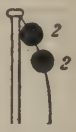


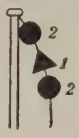
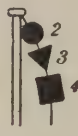
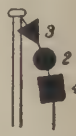
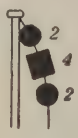
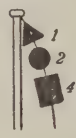
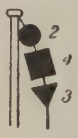
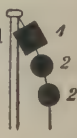
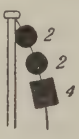
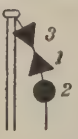
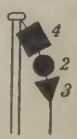
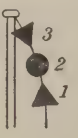
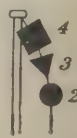
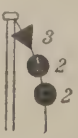
A 1 1 2 	I 2 1 2 	Q 2 3 3 	Y 3 2 3 
B 1 2 1 	J 2 1 3 	R 2 3 4 	Z 3 2 4 
C 1 2 2 	K 2 1 4 	S 2 4 1 	SPECIAL.
D 1 2 3 	L 2 2 1 	T 2 4 2 	Code Flag Sign. 4 2 1 
E 1 2 4 	M 2 2 3 	U 2 4 3 	Alphabetical Sign. 4 2 2 
F 1 3 2 	N 2 2 4 	V 3 1 2 	Numeral Sign 4 2 3 
G 1 4 2 	O 2 3 1 	W 3 2 1 	4 3 2
H 2 1 1 	P 2 3 2 	X 3 2 2 	Finishing sign after completion of word or number, when spelling or making numeral signals.

GENERAL ALPHABETICAL TABLE FOR MAKING THE INTERNATIONAL CODE SIGNALS BY MEANS OF DISTANT SIGNALS BY SHAPES

"PREPARATIVE," "ANSWERING," OR "STOP," after each complete signal.

ANNUL THE WHOLE SIGNAL.



A 1 1 2	I 2 1 2 	Q 2 3 3	Y 3 2 3
B 1 2 1	J 2 1 3	R 2 3 4 	Z 3 2 4 
C 1 2 2	K 2 1 4	S 2 4 1	SPECIAL SIGNS.
D 1 2 3	L 2 2 1	T 2 4 2 	Code Flag Sign. 4 2 1
E 1 2 4 	M 2 2 3	U 2 4 3 	Alphabetical Sign. 4 2 2 
F 1 3 2	N 2 2 4 	V 3 1 2 	Numeral Sign, 4 2 3 
G 1 4 2	O 2 3 1	W 3 2 1 	4 3 2 
H 2 1 1	P 2 3 2	X 3 2 2 	Finishing sign after completion of word or number when spelling or making numeral signals.

If no cones are available, a square flag may be substituted for the cone point upward, a pennant for the cone point downward, and a wheft for the drum.

Distant Signals.

1. Distant Signals are required when, in consequence of distance or the state of the atmosphere, it is impossible to distinguish the colors of the flags of the International Code, and, therefore, to read a signal made by those flags; they also provide an alternative system of making the signals in the Code, which can be adopted when the system of flags cannot be employed.

2. Three different methods of making Distant Signals are explained below:

(a) By Cones, Balls, and Drums.

(b) By Balls, Square Flags, Pennants, and Whefts.

(c) By the Fixed Coast Semaphore.

The last method (Fixed Coast Semaphore) is not necessarily a method of making Distant Signals, as it can be, and is, used at close quarters and under conditions when flags could equally be employed, but it has been placed here under the heading of Distant Signals for ease of explanation.

3. The Characteristic of Distant Signals is the Ball; one ball at least appearing in each hoist of the Distant Code. In the case of the Semaphore the ball is replaced by a Disk.

4. Hitherto only three Symbols have been required for Distant Signaling, but the increase made in the number of flags of the International Code renders four Symbols necessary, in order that it may be possible to provide a distinct hoist to represent each of the flags of the Code (i. e., letters of the alphabet.

5. Distant Signals are made

From a ship—by hoisting shapes.

From the shore—by hoisting shapes, or by the position of the arms of a Semaphore.

6. The Shapes used as Symbols are:

(a) A Cone point upward.
A Ball.
A Cone point downward, and
A Drum. (The Drum should be at least one-third greater in height than the Ball).

(b) A square Flag may be substituted for the cone point upward.
A Ball.
A Pennant may be substituted for the cone point downward, and
A Pennant with the fly tied to the halyards, or a Wheft for the drum.
(A wheft is any flag tied in the center.)

As in calms, or when the wind is blowing toward or from the observer, it is impossible to distinguish with certainty between a square flag, pennant, and wheft, and as flags when hanging up and down may hide one of the balls and so prevent the signal being understood, the system of cones and drums is preferable to that of flags, pennants, and whefts.

(c) In signalling by the Semaphore, the positions of the arms represent the shapes.

TESTIMONIALS.

East Boston, Mass., Mass. Nov. 14, 1901.

Mr. H. Louderbough.

Dear Sir.—As a ship painter, I have for several years applied and sold your New Jersey Marine Paints and Yacht Specialties, and found that they were exceptionally well ground, producing a smooth surface, which, with their well known Anti-Fouling qualities, have given them a popularity that no other Marine Paint has. Yours truly,

H. B. NICKERSON.

Jersey City, N. J., Nov. 12, 1901.

Mr. Harry Louderbough.

Dear Sir.—A trial of a good paint is its own endorsement many times over; we have found upon trial and use for many years your "New Jersey" Perfect Ship Black is all you can claim for it, being the blackest black Paint made, drying quickly, and presenting a good appearance as well.

Yours truy,

THE BROWN DRY DOCK COMPANY.

Hoboken, N. J., May 20, 1890.

Mr. H. Louderbough.

Dear Sir.—In considering the relative merits of New Jersey Copper Paint, would say in connection to same, that we have tried said Copper Paint on two of our Tugs, and it has proven itself what it was represented to be, the best in the market.

Yours respectfully,

REEVES & BUSH.

Mobile, Ala., Oct. 31, 1901.

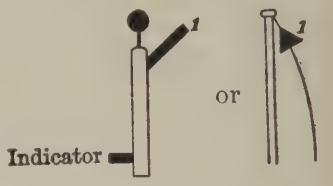
H. Louderbough.

Dear Sir.—In all our experience in the application and use of Copper Paints, your "New Jersey" Copper Paints have, for many years, been used by us in supplying the wants of our patrons who come to our Dry Docks for repairs and painting and it is the general expression that your brand of "New Jersey" Marine Paints is without an equal.

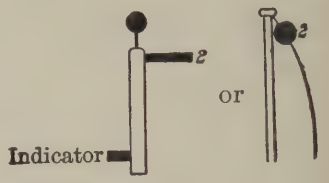
OLLINGER & BRUCE DRY DOCK CO.

7. To simplify the "Taking in," "Reporting," and "Reading off" of the Distant Signals, the four positions of the Semaphore Arms, and the four Symbols have been numbered 1, 2, 3, 4

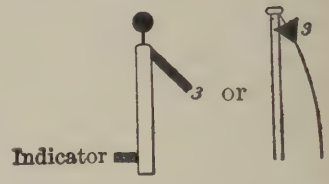
1 representing the Semaphore Arm pointing upward, on the opposite side of the indicator, a Cone with the point upward, or a square Flag.



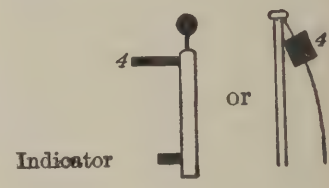
2 representing the Semaphore Arm pointing horizontally, on the opposite side to the indicator, or a Ball.



3 representing the Semaphore Arm pointing downward, on the opposite side to the indicator, a Cone with the point downward, or a Pennant.



4 representing the Semaphore Arm pointing horizontally, on the same side as the indicator, a Drum, or a Pennant with the fly tied to the halyards, or a Wheft.



SEMAPHORE SIGNALS.

INSTRUCTIONS FOR THE USE OF THE BRITISH MOVABLE SEMAPHORE.

THE INDICATOR.

The Indicator denotes from which side the signs are to be read, but when first shown it is to call attention, and may be considered the preparative signal. When closed it denotes the finish of the communication.

HOW TO SEMAPHORE.

The person intending to Semaphore will make the International Code Signal VOX (I am going to Semaphore to you), and set his Semaphore at the alphabetical sign (see Plate VII) with the Indicator out, and wait until the person to whom the Semaphore signal is to be made hoists his answering pennant CLOSE UP. Then he will proceed with the communication by spelling, making a momentary pause between each sign or letter; the arms are to be dropped between each word or group, the Indicator alone remaining out.

Should the answering pennant be dipped by the person taking in the signal, the last TWO words are to be repeated until the answering pennant is again hoisted CLOSE UP.

When in the middle of a spelling signal numerals have to be made, the Semaphore is to be put at the numeral sign (see Plate VII), and the number then made. When the numeral signal is finished the alphabetical sign is to be made and the communication by spelling proceeded with.

PERFECT SHIP BLACK

The Blackest Black Paint Made.

SHIP ZINC. **SHIP LEAD.**

HOW TO ANSWER AND TAKE IN SEMAPHORE SIGNALS.

The answering pennant is to be hoisted CLOSE UP by the person taking in the Semaphore signal, thus denoting he is ready to read and write down the signal.

It is to be "dipped" when a word is lost, and the person making the signal is then to repeat the TWO last words until the answering pennant is hoisted again CLOSE UP.

In answering by the Semaphore the arm in position (1) represents the answering pennant at the dip.

And in position (3) the answering pennant close up.

SEMAPHORING BY HAND FLAGS.

(1) British Method.

The British method of Semaphoring by flags held in the hand which is shown in plate VIII is exactly the same as the British Movable Semaphore system, which has just been explained, the positions of the apparatus which denote the letters, numbers, and special signs being, it will be seen, identical in each case, and the only difference being in the apparatus employed.

(2) French Method.

The French method of Semaphoring by flags held in the hand (see Plate IX) is based on the same principle as the British method, but the positions in which the flags are held to denote the letters, etc., are different.

"New Jersey" Iron Bottom Paints.

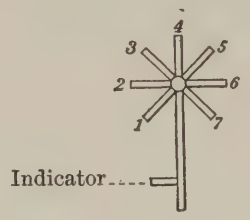
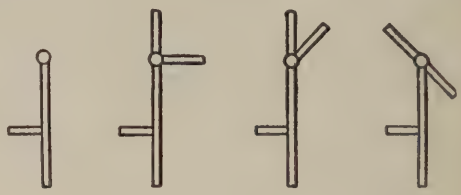
"NEW JERSEY" ANTI-CORROSIVE and ANTI-FOULING paints for the bottoms of iron and steel vessels. One of the most difficult paints to manufacture is a paint to protect the submerged bottom of an iron vessel; the natural enemy to iron is rust, and salt water only increases this to a very great extent; the problem is how to make paint that will remain hard under water and with tenacity enough to stick on, checking the ravages of rust; after this anti-corrosive paint has been applied another problem presents itself in how to produce an anti-fouling paint for the second coat that, although it is a poisonous paint, will not destroy the under coat or be injurious to the iron.

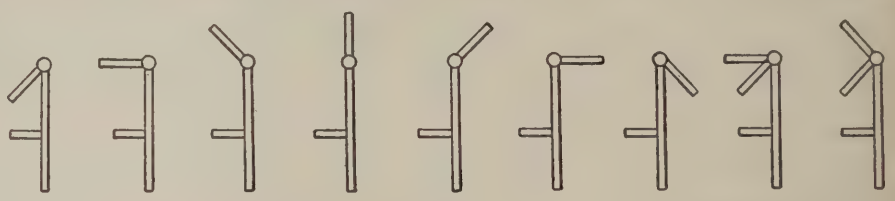
Our "NEW JERSEY" ANTI-CORROSIVE and ANTI-FOULING paints have been manufactured upon these very important lines and a trial of them is greatly desired to prove their worth. Our testimonials give them hearty endorsement.

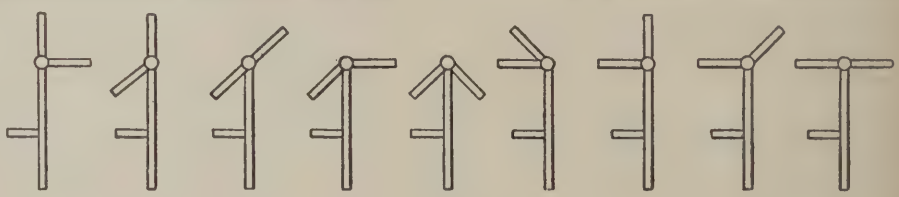
"New Jersey" Spar Varnish.

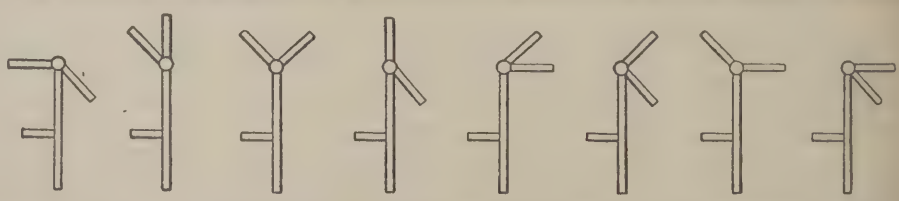
Wood or iron exposed to the weather must be protected. As a further protection over a painted surface where exposure is near salt water or its influence, only a high grade varnish can be used; even the best will in time be affected. Our "NEW JERSEY" SPAR VARNISH is durable. It presents a good finished surface if care is used in applying and the varnish is not reduced with turpentine to make it flow freely.

THE BRITISH MOVABLE SEMAPHORE.

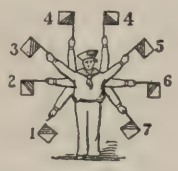
Semaphore Signs.	Governing Signs.			
				
	Preparative. When closed it denotes the finish.	Alphabetical.	Numeral.	Annul or negative.

Signs.									
Alphabetical Signification.	A	B	C	D	E	F	G	H	I
Numerical Signification.	1	2	3	4	5	6	7	8	9

Signs.									
Alphabetical Signification.	J *Also the alphabetical sign.*	K	L	M	N	O	P	Q	R
Numerical Signification.		0							

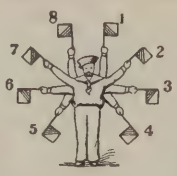
Signs.								
Alphabetical Signification.	S	T	U	V	W	X	Y	Z

BRITISH METHOD OF SEMAPHORING BY HAND FLAGS.



SIGNS.						
Alphabetical Signification.	A	B	C	D	E	F
Numeral Signification.	1	2	3	4	5	6
SIGNS.						
Alphabetical Signification.	G	H	I	J	K	L
Numeral Signification.	7	8	9	ALSO ALPHABETICAL SIGN.	0	
SIGNS.						
Alphabetical Signification.	M	N	O	P	Q	R
SIGNS.						
Alphabetical Signification.	S	T	U	V	W	X
SIGNS.						
Signification.	Y	Z		ALPHABETICAL.	NUMERAL.	ANNUL.

FRENCH METHOD OF SEMAPHORING BY HAND FLAGS.



SIGNS.						
Alphabetical Signification.	A	B	C	D	E	F
Numeral Signification.	1	2	3	4	5	6
SIGNS.						
Alphabetical Signification.	G	H	I	J	K	L
Numeral Signification.	7	8	9	0		
SIGNS.						
Alphabetical Signification.	M	N	O	P	Q	R
SIGNS.						
Alphabetical Signification.	S	T	U	V	X	Y
SIGNS.						
Signification.	Z		DO NOT UNDERSTAND.	NUMBERS.	ATTENTION	END OF WORD OR PHRASE.

NOTE.—The **W** is made by means of two consecutive **V's.** To indicate the finish of a Numerical Signal the Number sign is again made: thus the number sign begins and ends Numerical Signals.

United States Army and Navy Signal Code.

Communication may be had by this code with the United States Army, Navy, Revenue Cutter, and Life-Saving services.

A			2	2	H		1	2	2	O		2	1	V	1	2	2	2
B	2	1	1	2	I				1	P	1	2	1	2	W	1	1	2	1
C		1	2	1	J	1	1	2	2	Q	1	2	1	1	X	2	1	2	2
D		2	2	2	K	2	1	2	1	R		2	1	1	Y		1	1	1
E			1	2	L		2	2	1	S		2	1	2	Z	2	2	2	2
F	2	2	2	1	M	1	2	2	1	T				2	tion	1	1	1	2
G	2	2	1	1	N			1	1	U		1	1	2					

NUMERALS.

1	1	1	1	1	3	1	1	1	2	5	1	1	2	2	7	1	2	2	2	9	1	2	2	1
2	2	2	2	2	4	2	2	2	1	6	2	2	1	1	8	2	1	1	1	0	2	1	1	2

ABBREVIATIONS.

a.....after	c.....can	n.....not	t.....the	ur.....your	wi.....with
b.....before	h.....have	r.....are	u.....you	w.....word	y.....yes

x x 3.. "numerals follow" or "numerals end."
sig. 3.. "signature follows."

CONVENTIONAL SIGNALS.

End of a word	3
End of a sentence	33
End of a message	333
Error	12.12.3
Acknowledgment, or, "I understand"	22 22.3
Cease signaling	22.22.22.333
Wait a moment	1111.3
Repeat after (word)	121.121.3.22.3 (word)
Repeat last word	121.121.33
Repeat last message	121.121.121.333
Move a little to right	211.211.3
Move a little to left	221.221.3
Signal faster	2212.3

INSTRUCTIONS FOR USING THE SYSTEM.

The whole number opposite each letter or numeral stands for that letter or numeral.

TO SIGNAL WITH FLAG, TORCH, HAND LANTERN, OR BEAM OF SEARCH LIGHT.

There are but one position and three motions.

The first position is with the flag or other appliance held vertically, the signalman facing squarely towards the station with which it is desired to communicate.

The first motion, or "one" or "1," the signal is waved to the right of the sender and will embrace an arc of 90°, starting with the vertical and returning to it, and will be made in a plane exactly at right angles to the line connecting the two stations.

The second motion, or "two" or "2," is a similar motion to the left of the sender.

To make the third motion, "front" or "three" or "3," the signal is waved to the ground directly in front of the sender, and instantly returned to the first position.

Numbers which occur in the body of the message must be spelled out in full.

To use the torch or hand lantern, a footlight must be used as a point of reference to the motion. The lantern is more conveniently swung out upwards, by hand, from the footlight for "1" and "2" and raised vertically for "3."

TO SEND A MESSAGE.

"To call" a station, signal its initial or call letter until acknowledged. To acknowledge a call or receipt of a message, signal "I understand."

Make a slight pause after each letter and also after "front." If the sender discovers that he has made an error, he should make the "front" and "12, 12, 3," after which he proceeds with the message, beginning with the word in which the error occurred.

FLASH SIGNALS WITH LANTERN, HELIOGRAPH, OR SEARCH LIGHT.

Use short flash for "1," two short flashes in quick succession for "2," and a long steady flash for "3." The elements of a letter should be slightly longer than in sound signals.

To call a station, make the initial or call letter until acknowledged. Then turn on a steady flash until answered by a steady flash. The calling station will then proceed with the message.

All other conventional signals are the same as for the flag.

SOUND SIGNALS WITH FOG WHISTLE, FOG HORN, OR BUGLE.

Use one toot (about half second) for "1," two toots (in quick succession) for "2," and a blast (about two seconds long) for "3." The ear and not the watch is to be relied upon for the intervals.

The signal of execution for all tactical or drill signals will be one long blast followed by two toots in quick succession.

In the use of any other appliance, such as a bell, by which a blast can not be given, three strokes in quick succession will be given in the place of the blast to indicate "3."

When more than two vessels are in company, each vessel, after making "I understand," should make her call letter that it may be certain which vessel has acknowledged.

Consolidated Code of Signals.

FOR OCEAN GOING TUGS AND BARGES

	(Long Whistle ——)	(Short Whistle –)
1.	7 Short – – – – – – –	Attention.
2.	1 Long —— 3 Short – – –	Get Underway.
3.	1 Long —— 1 Short –	Pay out Hawser.
4.	1 Long —— 1 Short – 1 Long ——	Make Fast Hawser.
5.	1 Long —— 4 Short – – – –	Prepare to Anchor.
6.	1 Long —— 2 Short – –	Shorten Hawser.
7.	2 Long —— —— 3 Short – – –	Let go Stern Barge.
8.	3 Long —— —— ——	Let go Hawser.
9.	2 Long —— —— 1 Short – 1 Long ——	Let go Anchor.
10.	1 Long ——	Port your Helm.
11.	2 Long —— ——	Starboard your Helm.
12.	4 Long —— —— —— ——	All Right go Ahead.
13.	1 Long —— 2 Short – – 1 Long ——	Stern Barge Adrift.
14.	1 Long —— 3 Short – – – 1 Long ——	Call for Tug.
15.	1 Long —— 5 Short – – – – –	Get up Steam.
16.	2 Long —— —— 1 Short –	Set Sail.
17.	2 Long —— —— 2 Short – –	Take in Sail.
18.	2 Long —— —— 3 Short – – – 1 Long ——	Hawser has Parted.
19.	2 Long —— —— 2 Short – – 1 Long ——	Head Barge keep up Sail.
20.	2 Long —— —— 4 Short – – – –	My Rudder Disabled.
21.	2 Long —— —— 5 Short – – – – –	Anchor Separate.
22.	1 Short – 1 Long ——	We are Leaking.
23.	5 Long —— —— —— —— ——	Pumps cannot hold leak.
24.	2 Short – – 1 Long ——	Your lights are out.
25.	3 Short – – – 1 Long ——	Come Alongside.
26.	4 Short – – – – 1 Long ——	Stop Tug.
27.	5 Short – – – – – 1 Long ——	Signal not Understood.
28.	1 Short – 1 Long —— 1 Short – 1 Long ——	Engine Disabled.
29.	1 Short – 2 Long —— ——	Take me to Harbor.
30.	2 Short – – 1 Long —— 2 Short – –	Haul Head to Sea.
31.	2 Long —— —— 1 Short – 2 Long —— ——	Anchor and Hold on to Hawsers.
32.	8 Short – – – – – – – –	Danger Signals, and { By Day, Flag in Rigging. At Night, 1 Red Light in Rigging.

NOTICE.—All Captains of Barges must in all cases stand by their Wheels in East River and Hell Gate, also going in or out of any Port or Harbor, and must answer all signals promptly.

Morse Signal Code.

— indicates a LONG of about 3 seconds duration.
– indicates a SHORT of about 1 second duration.
Preparative Signal to attract attention – – – – – – – – – – etc.
Answering Signal, or, I understand — – — – — – — – etc.
Interval between each flash or sound..... 1 second.
Interval between each letter.....3 seconds.
Interval between each word.....6 seconds.

A	– —	N	— –
B	— – – –	O	— — —
C	— – — –	P	– — — –
D	— – –	Q	— — – —
E	–	R	– — –
F	– – — –	S	– – –
G	— — –	T	—
H	– – – –	U	– – —
I	– –	V	– – – —
J	– — — —	W	– — —
K	— – —	X	— – – —
L	– — – –	Y	— – — —
M	— —	Z	— — – –

(a) LIGHT AND SOUND SIGNALS, ACCORDING TO COLOMB'S FLASHING SIGNALS SYSTEM.

The following urgent and important signals may be made at night or in thick weather, either by long and short flashes of light or by long and short sounds on a steam whistle, siren, fog horn, etc.

INSTRUCTIONS FOR THE USE OF FLASHING OR SOUND SIGNALS.

With flashing signals the lamp must always be turned toward the person addressed.

To attract attention, a series of rapid short flashes or sounds should be made and continued until the person addressed gives the sign of attention by doing the same.

If, however, it is supposed that the person addressed cannot reply, the signal may be made after a moderate pause, or, under certain circumstances, the communication may be made without preparatory signs.

After making a few rapid short flashes or sounds as an acknowledgement, the receiver must watch or listen attentively until the communication is completed, when he must make the sign indicated below, showing that the message is understood.

If the receiver does not understand the message, he must wait until the signal is repeated.

Duration of short flashes or sounds – ..... 1 second.
Duration of long flashes or sounds — ..... 3 seconds.
Interval between each flash or sound..... 1 second.
Answer, or, "I understand" — – — – — – — – etc.

SIGNALS.

You are standing into danger.....	– – —
I want assistance; remain by me.....	– – – —
Have encountered ice.....	– — —
Your lights are out (or, want trimming).....	– — — –
The way is off my ship; you may feel your way past me.....	– — –
Stop, or, heave to; I have something important to communicate.....	– — – –
Am disabled; communicate with me.....	– – — –

When a vessel is in tow, the following signals made by flashes of light may be used between her and the tug or towing vessel:

Steer more to starboard.....	–
Steer more to port.....	– –
Cast off hawsers.....	– – – –

(b) FLAG WAVING.

INSTRUCTIONS FOR COMMUNICATING BY FLASHING SIGNALS WITH A FLAG (GENERALLY TERMED FLAG WAVING).

The system used is the Morse Alphabet, the letters being made by groups of LONG and SHORT flashes caused by moving a flag through a long or short arc, as described below.

The signalman may work from left to right, or from right to left, as shown in figures 1 and 2, according to convenience and direction of the wind.

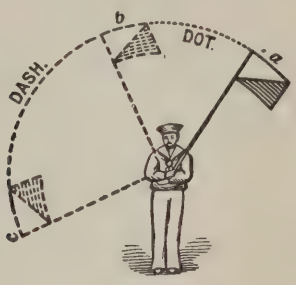


FIGURE 1.

FIGURE 2.

In the normal position (a) in the above figures, the flag should make an angle of 25° with a vertical line through the center of the body.

The pole should be kept high enough to permit seeing underneath the flag while in motion.

TO MAKE A SHORT FLASH OR DOT.

The flag is waved from a to b, and without any pause back again to the normal position.

TO MAKE A LONG FLASH OR DASH.

The flag is waved from a to c, and after a short but distinct pause at c brougnt back to the normal position.

WHEN SIGNALING A LETTER.

When signaling a letter the flashes representing it should be made in one continuous wave of the flag, taking particular care that no pause is made when at the normal position.

Example.—To make R — ——— — wave the flag from a to b back to a and without a pause down to c, making there a short but distinct pause (vide instructions for long flash) back to a. then without a pause to b and back to the normal position a.

HOW TO SIGNAL.

A pause equal to the length of a long flash should be made at the normal position a between each letter of a word, or letter of a group of letters.

When the word or group of letters is completed, the butt of the staff is to be brought to the ground, and the flag at the same moment gathered in.

A slight pause should be made at the normal position before commencing a word or group of letters.

In receiving a message the flag should be lowered and gathered in until required for answering.

POSITION OF THE SIGNALMAN.

The signalman should stand square to the station to which he is signaling, and the pole should be kept as upright as possible while in motion, the point never being allowed to droop to the front.

In order to keep the flag always exposed while moving it across the body to form the flashes, the point of the staff should be made to describe an elongated figure of 8 in the air.

CONVENTIONAL SIGNALS: THEIR EQUIVALENT LETTERS AND THE METHOD OF ANSWERING THEM.

Meaning.	Sign.	Equivalent letter and how made.	How answered.
Preparative.	— — — — — — etc.	By a succession of E's in one group.	By the general answer T.
Answer.	—	T (singly).	
Break sign.	— — — —	I I as separate letters.	
Stop.	— — — — — —	I I I as separate letters.	
Finish of a message.	— — — — —	V E as one group.	— — — R — — — D as separate letters.
Erase sign.	— — — — — etc.	By a succession of E's as separate letters.	By a succession of E's as separate letters.
Annul.	— W — — W —	W W as one group.	By W W as one group.
Repeat word after — (when a single word is required).	I M I — — — — — — W A — — — — followed by the word preceding the one required.	I M I as one group. W A as separate letters.	By the general answer T.
Repeat all after—(if more than one word is required).	I M I — — — — — — A A — — — —	I M I as one group. A A as separate letters.	By the general answer T.
Repeat all (if the whole message is to be repeated).	I M I — — — — — — A L L — — — — — — — — —	I M I as one group. A L L as separate letters.	By the general answer T.

THE USE OF THE SPECIAL SIGNS.

THE PREPARATIVE.

Is used to call attention, and is answered by the General Answer.

THE GENERAL ANSWER.

Is made by the long flash —, or letter T.

THE BREAK SIGN.

Is to be used between the address of the receiver and the text of the message, and, after the text, if the name of the sender is signaled.

THE STOP.

Is made by three separate letter I's.

THE FINISH.

Is to be made by V E in one group at the completion of a message, and is to be answered, if the message is understood, by R D in separate letters. N. B.—R D means Read.

THE ERASE.

Is made by a series of E's as separate letters, and is used to erase a word or group that has been wrongly sent, and is to be answered by the Erase.

THE ANNUL.

Is made by W W in one group,, and is used to negative ALL the message that has gone before, and is to be answered by the Annul.

METHOD OF ANSWERING.

Each word when understood is to be answered by one long flash — (T).

If a word is not answered, the sender is to repeat it until answered by a long flash.

At the end of the message, if understood, receiver will make - — - — - - (or R D), meaning Read.

The Erase and Annul signs are to be answered by their own signs.

METHOD OF SIGNALING NUMBERS.

All numerals, whether representing time, distance, numbers, etc., are to be spelled in full.

METHOD OF ASKING FOR REPETITION.

If the receiver requires any word to be repeated, he makes

— — - - — - — — - — —

Repeat. W A

(or, repeat word after) the word — (or if necessary, words) preceding the doubtful word.

NOTE.—When W A is only sent, the Repeat sign is implied.

If the receiver requires the remainder of the message, he makes

— — - - - — - —

Repeat. A A

(or, repeat all after) the word — preceding the doubtful ones.

If the receiver wants all the message repeated, he makes

- - — — - - - — - - - — - —

Repeat. A L L

When he requires no more repetition, he makes - — - — - - (or R D), which means the signal is read.

IF A MISTAKE IS MADE IN A WORD.

The sender makes the Erase sign - - - - - etc., E's as separate letters, which is to be answered by the Erase sign.

N. B.—This only applies to the last word made.

IF A WHOLE MESSAGE REQUIRES TO BE NEGATIVED.

The sender makes the Annul - — — - — — (or, W W as one group), which is to be answered by the Annul.

Rules for Reviving Persons Rescued from the Water.

Published for the Information and Guidance of Inexperienced Persons.

FIGURE 1.

1.—Loosen the clothing; place the face downward, with the forehead resting on one of the wrists, and the face turned to one side. Open the mouth; seize the tongue between the fingers, covered with a handkerchief or piece of cloth, and draw it forward between the teeth; clear the mouth and throat from mucus by passing the forefinger, covered with a handkerchief or piece of cloth, far back into the mouth, thus opening a free passage to the windpipe. See Fig. 1.

FIGURE 2.

2.—Turn the body face upward, shoulders resting on a folded coat or pillow; keep the tongue drawn forward; raise the arms backward and upward to the sides of the head (THIS EXPANDS THE CHEST AND ALLOWS THE AIR TO ENTER THE LUNGS)—see Fig. 2; then slowly

move them downward, bending them so that the elbows will come to the sides and the hands cross on the pit of the stomach, and press them gently but strongly against the sides and chest (THIS FORCES THE AIR OUT OF THE LUNGS) see Fig. 3. Continue these two movements (WHICH PRODUCE ARTIFICIAL BREATHING) very deliberately about ten or twelve times in a minute, and without ceasing, until the patient breathes naturally, or until satisfied that life is extinct.

FIGURE 3.

3.—While this is being done a little friction on the chest may be produced by rubbing gently with a warm flannel, and the body may be stripped and wrapped in dry blankets.

After NATURAL BREATHING begins, continue very gently, for a few minutes, the two movements which produce artificial breathing.

After natural breathing is FULLY restored, give the patient a teaspoonful of brandy, hot sling or tea, two or three times a minute, until the beating of the pulse can be felt at the wrist.

Rub the arms and legs upward, and the feet and hands with warm or dry flannel.

Apply hot cloths to the body, legs and arms and bottles of hot water to the feet.

CAUTION.

1.—Do not be discouraged if animation does not return in a few minutes. THE PATIENT SOMETIMES RECOVERS AFTER HOURS OF LABOR.

2.—Do not allow the tongue to fall back and close the windpipe while the arms are being worked.

3.—Do not rub the legs and arms until natural breathing is restored.

4.—Do not put any liquid in the mouth until natural breathing is FULLY restored.

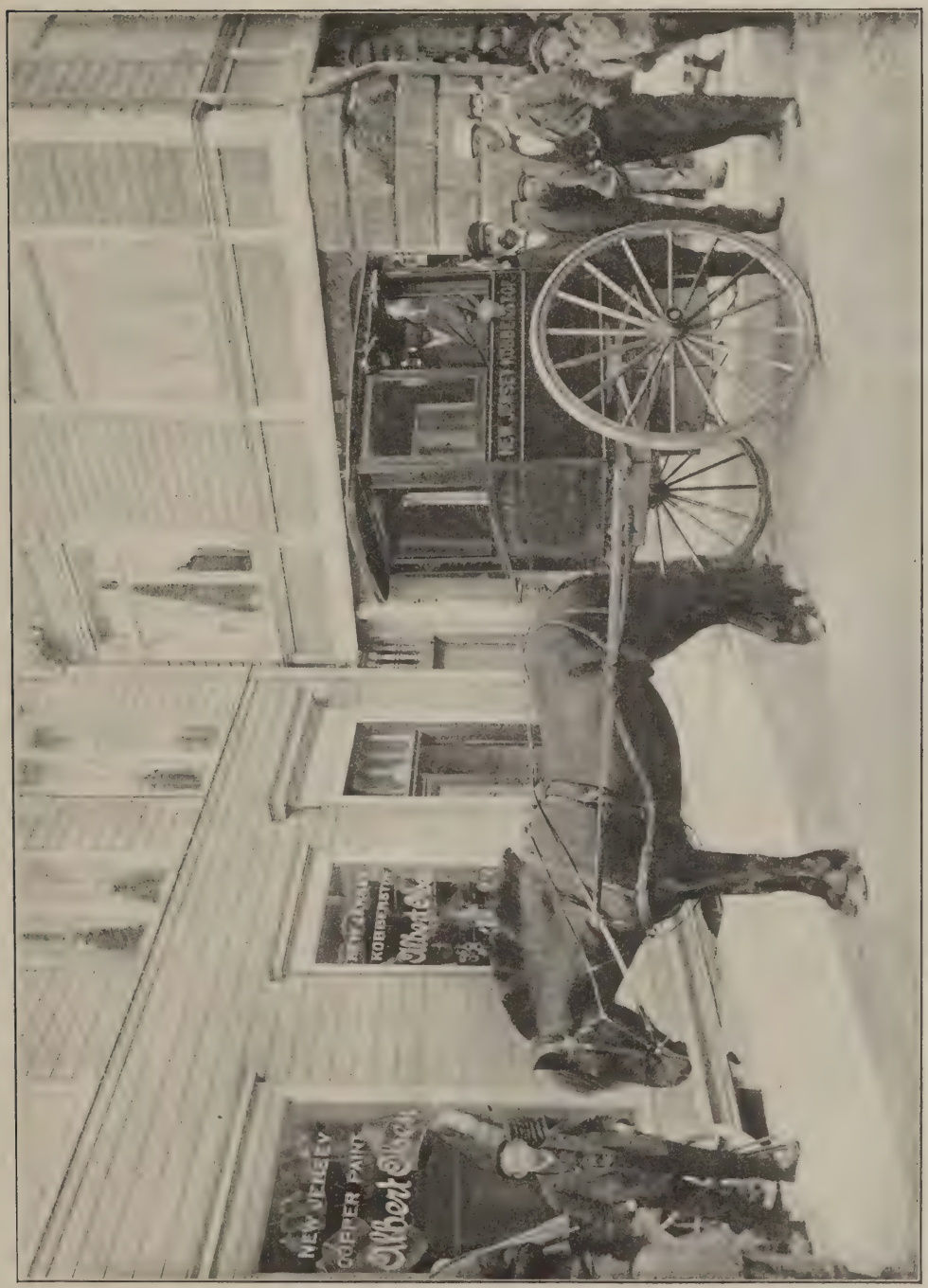
5.—Do not roll the body or handle it roughly.

6.—Do not allow the head to hang down.

THE BEST AND MOST USED,

"New Jersey" Copper Paint

SO SAY OUR TESTIMONIALS.



This rubber tired wagon was photographed at Aalesund, Norway, and was shipped from the United States by the New Jersey Paint Works, H. Louderbough, Prop'r, to be used by his salesman along the coast of Norway for convenience in selling "New Jersey" Copper Paint and distributing advertising matter.

TWO-CENTURY CALENDAR

YEARS 1801 TO 1902								YEARS 1903 TO 2003						
1801	1802	1803	....	1804	1805	1806		1903	....	1904	1905	1906	1907	....
1807	....	1808	1809	1810	1811	....		1908	1909	1910	1911	....	1912	1913
1812	1813	1814	1815	....	1816	1817		1914	1915	....	1916	1917	1918	1919
1818	1819	....	1820	1821	1822	1823		....	1920	1921	1922	1923	....	1924
....	1824	1825	1826	1827	....	1828		1925	1926	1927	....	1928	1929	1930
1829	1830	1831	....	1832	1833	1834		1931	....	1932	1933	1934	1935	....
1835	.....	1836	1837	1838	1839	....		1936	1937	1938	1939	....	1940	1941
1840	1841	1842	1843	....	1844	1845		1942	1943	....	1944	1945	1946	1947
1846	1847	....	1848	1849	1850	1851		....	1948	1949	1950	1951	....	1952
....	1852	1853	1854	1855	....	1856		1953	1954	1955	....	1956	1957	1958
1857	1858	1859	....	1860	1861	1862		1959	....	1960	1961	1962	1963	....
1863	....	1864	1865	1866	1867	....		1964	1965	1966	1967	....	1968	1969
1868	1869	1870	1871	....	1872	1873		1970	1971	....	1972	1973	1974	1975
1874	1875	....	1876	1877	1878	1879		....	1976	1977	1978	1979	....	1980
....	1880	1881	1882	1883	....	1884		1981	1982	1983	....	1984	1985	1986
1885	1886	1887	....	1888	1889	1890		1987	....	1988	1989	1990	1991	....
1891	....	1892	1893	1894	1895	....		1992	1993	1994	1995	....	1996	1997
1896	1897	1898	1899	1900	1901	1902		1998	1999	....	2000	2001	2002	2003
E	F	G	A	B	C	D	January	E	F	G	A	B	C	D
D	E	F	G	A	B	C	January	D	E	F	G	A	B	C
P	Q	R	S	T	U	V	February	P	Q	R	S	T	U	V
✢	W	X	Y	Z	⋈	▬	February	✢	W	X	Y	Z	⋈	▬
A	B	C	D	E	F	G	March	A	B	C	D	E	F	G
L	M	N	O	H	J	K	April	L	M	N	O	H	J	K
F	G	A	B	C	D	E	May	F	G	A	B	C	D	E
J	K	L	M	N	O	H	June	J	K	L	M	N	O	H
D	E	F	G	A	B	C	July	D	E	F	G	A	B	C
G	A	B	C	D	E	F	August	G	A	B	C	D	E	F
K	L	M	N	O	H	J	September	K	L	M	N	O	H	J
E	F	G	A	B	C	D	October	E	F	G	A	B	C	D
H	J	K	L	M	N	O	November	H	J	K	L	M	N	O
C	D	E	F	G	A	B	December	C	D	E	F	G	A	B

DIRECTIONS.

Look for the Year desired, and follow the column in which it is found down to the square on a line with the Month wanted. The letter or sign within this space is the symbol of the Calendar on the opposite page, which will give the days of the week for the month and year in question.

Years printed in red are "Leap Years." For the months of JANUARY and FEBRUARY in Leap Years be guided by the red letters and signs given for those months.

WINTER'S TWO-CENTURY CALENDAR. COPYRIGHT, 1900, BY JOHN F. WINTER.

TWO-CENTURY CALENDAR

A

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	..	..	..	..
..	..	..	..	..	..	..

B

S	M	T	W	T	F	S
..	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	..	..	..
..	..	..	..	..	..	..

C

S	M	T	W	T	F	S
..	..	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	..	..
..	..	..	..	..	..	..

D

S	M	T	W	T	F	S
..	..	..	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	..
..	..	..	..	..	..	..

E

S	M	T	W	T	F	S
..	..	..	..	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31
..	..	..	..	..	..	..

F

S	M	T	W	T	F	S
..	..	..	..	..	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	..	..	..	..	..	..

G

S	M	T	W	T	F	S
..	..	..	..	..	..	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	..	..	..	..	..

H

S	M	T	W	T	F	S
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J

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..	1	2	3	4	5	6
7	8	9	10	11	12	13
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28	29	30	..	..	..	..
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K

S	M	T	W	T	F	S
..	..	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
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L

S	M	T	W	T	F	S
..	..	..	1	2	3	4
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19	20	21	22	23	24	25
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M

S	M	T	W	T	F	S
..	..	..	..	1	2	3
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11	12	13	14	15	16	17
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N

S	M	T	W	T	F	S
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O

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P

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Q

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R

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27	28	..	..	..	..	..
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S

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27	28	29	..	..	..	..
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19	20	21	22	23	24	25
26	27	28	29	..	..	..
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25	26	27	28	29	..	..
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■

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24	25	26	27	28	29	..
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23	24	25	26	27	28	29
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FIELD GLASSES.

There is perhaps no line along which there has been a greater amount of improvement during the last few years than that of field glasses, both as relates to the mechanical construction and optical perfection.

It is no longer necessary, in order to see objects at even a considerable distance, to carry around a great cumbersome sort of a telescope or field glass; instead of this we can now get an instrument which we can put into our coat pocket and which will at the same time give us as much of a magnification as our old telescope and at the same time a field of vision anywhere from four to ten times greater than with the old glass.

Field of Old Style Glass.

Field of New Style Glass.

The ultimate purpose of all field glasses is to produce, at the proper distance, and with sufficient magnification to render every detail distinct, the image of objects too far away to be clearly seen by the naked eye. We require, therefore, of a good field glass not only the optical perfection and proper lighting of the image, but also a wide angle of view and the necessary magnifying power. Field glasses being intended for use in the hand, size and weight become very important considerations. Optical Science has obtained a high degree of perfection in any one of these considerations, taken individually, but not until very recently has it been possible to combine them all with any chance of success. Optical Science teaches that the conditions above mentioned are interdependent and that improvement in one line usually necessitates a deficiency in another. For instance, a great magnifying power implies a smaller field of view, and to increase the brightness of the image we must enlarge the diameter of the object lens and therefore the length of the entire instrument, rendering it correspondingly unwieldy. An extended angle of view can only be obtained by a limitation of the magnifying power, etc. To reconcile these and similar antagonistic properties constitutes the main difficulty in the perfecting of the telescopic system, and is the problem which has taxed the knowledge and ingenuity of the most prominent opticians for nearly three centuries.

At this time, however, these difficulties have been overcome, and the result is as stated before, an instrument compact in form, optically and mechanically perfect.

LINCOLN TRUST COMPANY
OF NEW JERSEY

Cor. Montgomery and Washington Streets

JERSEY CITY, N. J., U. S. A.

CAPITAL AND SURPLUS, = = $342,000.00

....*OFFICERS*....

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ANDREW SPOTTS, Vice-President
EDWIN M. FARRIER, Sec'y. and Treas.

....*DIRECTORS*....

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Receives deposits, subject to check, and allows interest on daily balances.
Loans made on Collateral Security and on Bond and Mortgage, either installment or for a specified time.
Time deposits received, and interest at the rate of four per cent. per annum allowed on sums not exceeding one thousand dollars ; three per cent. from one thousand dollars to three thousand dollars.

LINCOLN TRUST CO. BUILDING
Cor. Montgomery & Washington Sts.
JERSEY CITY, N. J.
FINE OFFICE BUILDING
Centrally located in the business section, three blocks from Pennsylvania R. R. Ferries.
WELL EQUIPPED GOOD SERVICE
Mail Chute Electric Light Elevators
FRANK STEVENS, Agent
55 Montgomery St., Jersey City

ASSETS
January 1, 1905:
$19,417,329.53

—THE—
HOME
INSURANCE CO.
NEW YORK.

SURPLUS
As Regards Policy-Holders:
$10,376,321.23

Office: - - No. 56 Cedar Street

LIABILITIES:

Cash Capital	$3,000,000.00
Reserve Premium Fund	7,210,566.00
Unpaid Losses	976,171.49
Unpaid Re-Insurance, and other claims	779,270.81
Reserve for Taxes	75,000.00
Net Surplus	7,376,321.23
	$19,417,329.53

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Vice-Presidents:
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FREDERIC C. BUSWELL.
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CLARENCE A. LUDLUM.

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Inland and Coastwise Marine Department.

GEO. H. SMITH & HICKS, Marine Managers.

76 WILLIAM STREET, - - NEW YORK.

Liberal Forms of Policy for Hulls, Cargoes, Towers' Liability and Merchandise in Transit, at Fair Rates.

LOUIS F. BURKE, Supt. Marine Dept. ALLEN H. DUMONT, Inspector and Surveyor.

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4960 JOHN. Private Branch Exchange to all Departments.

AFTER BUSINESS HOURS: { BURKE—2263 South Orange, N. J.
{ DUMONT—40 Bergen, Jersey City.

WONDERFUL TEST

FOR NEW JERSEY

ANTI-FOULING COMPOSITION.

THIS cut is a copy of a photograph of a piece of iron one end of which was painted with **NEW JERSEY ANTI-FOULING COMPOSITION**, manufactured by HARRY LOUDERBOUGH, Proprietor of NEW JERSEY PAINT WORKS, Jersey City, N. J., U. S. A. It was placed for six months in the harbor of Norfolk, Va. Upon the unpainted end note the large number of barnacles and also the vegetable growth fastened to it.

Ooserve where the Anti-Fouling Composition was applied—its splendid condition.

The American Institute Fair of New York has awarded us the highest attainable Medal for our New Jersey Marine Paints.

OUR MARINE PAINT

SPECIALTIES.

NEW JERSEY

- Anti-Corrosive Paint, PRIMING COAT.
- Anti-Fouling Paint, FINISHING COAT.
- Copper Paint,
- Red Copper Paint, FOR YACHTS, VERY BRIGHT.
- Elastic Seam Paint,
- Yacht Black,
- Yacht White,
- Mast Paint,
- Smoke-Stack Paint,
- Deck and Floor Paint.

Our Productions are absolutely THE BEST. We make NO cheap or inferior goods.

New Jersey Paint Works,

H. LOUDERBOUGH, Prop.,

Cor. WAYNE and FREMONT STS.,

JERSEY CITY, N. J

Cable Address: JERSEY, Jersey City, N.J. U.S.A.

Ship Stores and Vessel's Supplies.

Ice
Fresh Beef
" Pork
" Lamb
" Mutton
Bbls. Beef
" Pork
Lbs. Pork
Bbls. Flour
" Potatoes
" Turnips
" Parsnips
" Onions
Doz. Cabbage
Hams
Shoulders
Bacon
Lbs. Codfish
¼ Bbl. Mackerel
Kitt Mackerel
Kitt Tongues and Sounds
Kitt Halibut Fins
Gall. Molasses
Gall. Syrup
Bot. Maple Syrup
Gall. Vinegar
Lbs. Lard
" Cabin Butter
" Crew Butter
" Granulated Sugar
" "C" Sugar
" Cabin Coffee
" Crew Coffee
" Mx. Tea
" Green Tea
" Black Tea
" Japan Tea
Pk. White Beans
" Red Beans
" Lima Beans
" Yellow Eye Beans
" Dried Peas
" Split Peas
Lbs. Evap. Apples
" " Peaches
" " Apricots
" Prunes
" " Best
" Raisins
" Currants
Boxes Cocoa
Pa. Cocoanut
Boxes Ex. Lemon
" " Vanilla
" " Ginger
Lbs. Ginger
Pa. Thyme
" Sage
Corn Starch
Nutmegs
Boxes Mustard
Bottle Mustard
Bags Salt
Lbs. Pepper
" Rice
Lbs. White Corn Meal
" Yellow Corn Meal
" Barley
Pa. Hominy
" Samp
" Oat Flakes
" Cream of Wheat
" Tapioca
" Sago
" Prepared Buckwheat
Lbs. Buckwheat
" Pilot Bread
Pa. Yeast Cakes
Bottles Rumford's
Lbs. Baking Powder
" Baking Soda
" Hops
Pa. Cinnamon
" Allspice
" Cloves
Bot. Curry Powder
" Catsup
" Sweet Oil
" Gherkins
" Mx. Pickles
" Chow Chow
Pails Gherkins
" Chow Chow
" Mx. Pickles
" Mince Meat
Pa. Mince Meat
" Gold Dust
" Pearline
" Soapine
Lbs. Sal. Soda
Bars Soap
Cakes Soap
" Sapolio
Bot. Ammonia
Bath Brick
Gross Matches
Boxes Parlor Matches
Pa. Stove Polish
Macaroni
Eggs
Coffee Essence
Cans Milk
" Tomatoes
" Corn
" Peas
" Lima Beans
" Succotash
" String Beans
" Peaches
" Pears
" Apricots
" Apples
" Pumpkin
" Pineapple
" Cherries
" Blackberries
" Blueberries
" Smoked Beef
" Corned Beef
" Roast Mutton
Cans Roast Beef
" Tongue
" Chicken
" Turkey
" Lobster
" Salmon
" Soft Clams
" Quahogs
" Lye

VESSEL'S LIST.

Galls. Kerosene Oil
" Boiled Oil
" Raw Oil
" Turpentine
" Dryer
" Bright Varnish
" Spar Varnish
" Tar
Packing
Piston Packing
Zinc
Spikes
Nails
Red Lead
Waste
Tallow
Gasolene
Cylinder Oil
Engine Oil
Sperm Oil
Lard Oil
Lbs. White Lead
Paint Brushes
Brooms
Balls Cotton Twine
Sk. Hemp Twine
Sail Needles
Coils Marline
" Spun Yarn
" Hambroline
" Roundline
" Hay Rope
Faths. Ratline
" Tarred Rope
" Tarred Rope
" Manila
" Manila
" Manila
Chimneys
Wicks

"NEW JERSEY"

Copper Paint (brown)
Yacht Red Copper Paint
Yacht Green Copper Paint
Yacht White
Anti-Corrosive Paint
Anti-Fouling Composition
Perfect Ship Black
Ship Zinc
Ship Lead
Mastine
Marine Mixed Paints
Liquid Metal Polish

Ship Painting Costs

THE expense of constant painting above decks is a matter of great importance. The life of an ordinary straight white lead paint is limited, at best, to a few weeks at sea and the early appearance of the familiar rust streaks is an intolerable blemish to the otherwise spick and span craft. There is a white lead which may be depended upon to withstand the sea exposure. It is not made with acid, indeed it is not corroded at all. Sublimed White Lead is a furnace product, the result of the application of a very intense heat (about 2500 degrees Fr.) to the purest lead ore known to metallurgy. All impurities are driven off by the white heat of the furnace and the purified lead remains, fire refined. It resists sulphur; it resists salt air; it protects and preserves the linseed oil which is the life of paint; it is, in fact, the only white lead that can live in salt air.

If you want a heavy-bodied paint with the above qualities, try Sublimed White Lead; you will be astonished at the results. If liquid or prepared paints are desired, we would be glad to send you a list of responsible paint grinders who manufacture paints based upon Sublimed White Lead.

The coal bunkers are doubtless the most difficult places on shipboard to keep properly painted. Picher Natural Blue Lead (made after the fashion of Sublimed White Lead) resists both sulphur and bilge water. Those who know it use it exclusively for all interior hull painting. It is the very best primer for all exposed iron and steel parts of vessels. If white interior finish is desired, use a first-class mixed paint based upon Sublimed White Lead. Try the Blue Lead on your bunkers, and see that it weighs eighteen pounds to the gallon.

Our booklets (free) are full of information as to painting in general and lead pigments in particular.

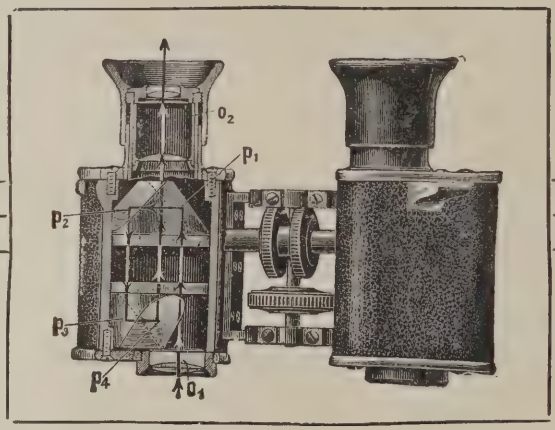
PICHER LEAD COMPANY

CHICAGO **NEW YORK**

The Goerz Trieder Binoculars

The Most Modern Form of

FIELD GLASS!



For the reading of SIGNAL FLAGS, and for general NAVIGATORS' USE. Nothing superior can be had.

Descriptive Catalogue upon Request.

C. P. GOERZ OPTICAL WORKS,

52 E. UNION SQUARE, NEW YORK.

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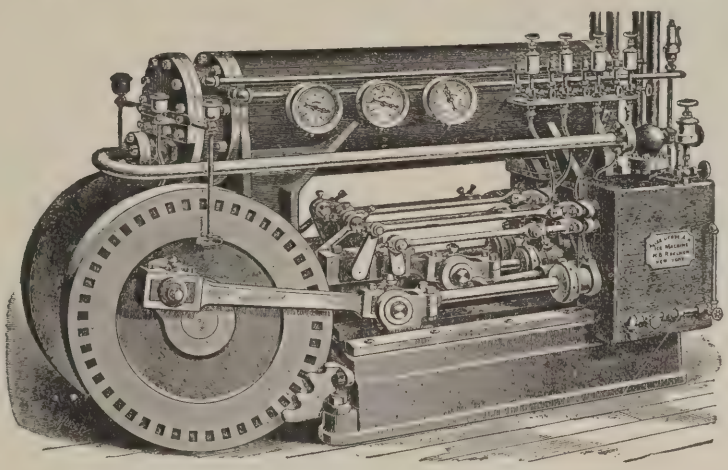

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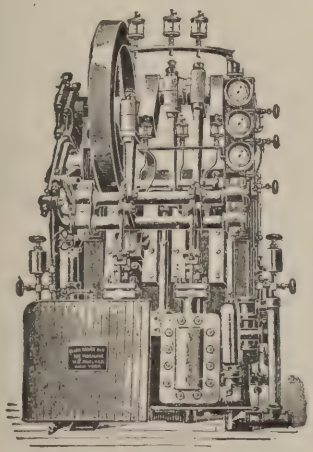

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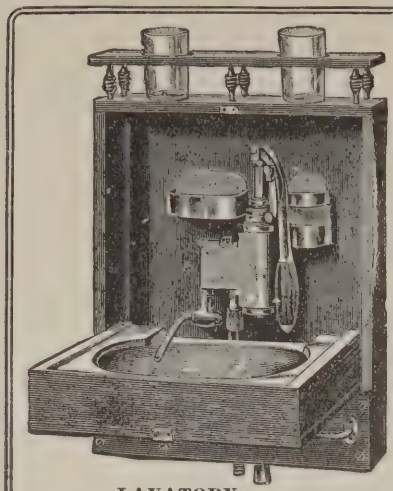

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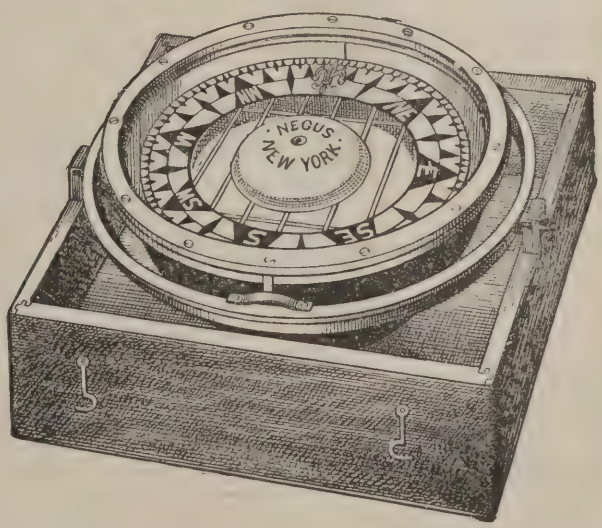

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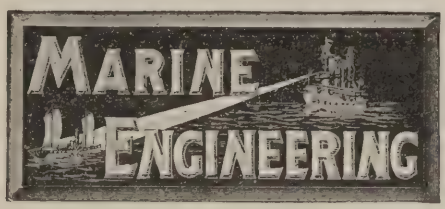

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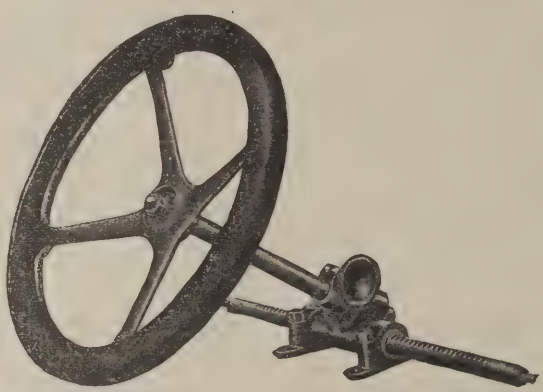

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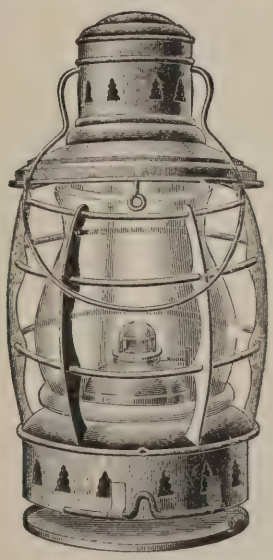

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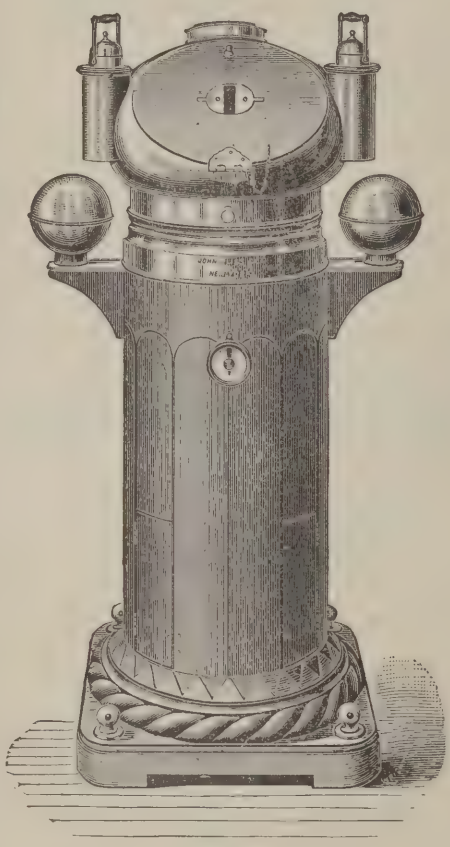

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Chesapeake Bay
Boston Harbor
New York Bay and Harbor
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Gloucester Harbor
Atlantic Coast, Block Island to Currituck

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Port Discovery and Washington Harbor
Admiralty Inlet, Puget Sound to Seattle
Olympia Harbor
Puget Sound, Seattle to Tacoma
Current-Course Projector
San Francisco Harbor
Commencement Bay and City of Tacoma

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SOUTH BAY
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Old Field Pt.
SMITHTOWN BAY
Huntington
Northport
Port Jefferson
Setauket
Stamford
Greenwich
Bridgeport
Westport
Norwalk
Saugatuck
Milford
Connecticut River
Niantic River
Thames River
Mystic River
Watch Hill
Westerly
Plum I.
Gardiners I.
Montauk Pt.
Shinnecock
Moriches Inlet
Fire Island Inlet
Jamaica
Hempstead
Rockaway
Patchogue
Bay Shore
Sag Harbor
Orient Pt.
Race Rock
Valiant Rock
Cornfield Shoals
Middle Ground
Horton Pt.
Horton Point Light
Fishers I.
Watch Hill Reef
Stonington
Block I.
Chalgru Bank
Fire Island New Inlet Wreck
Fire Island Light

PORTLAND HARBOR, MAINE.

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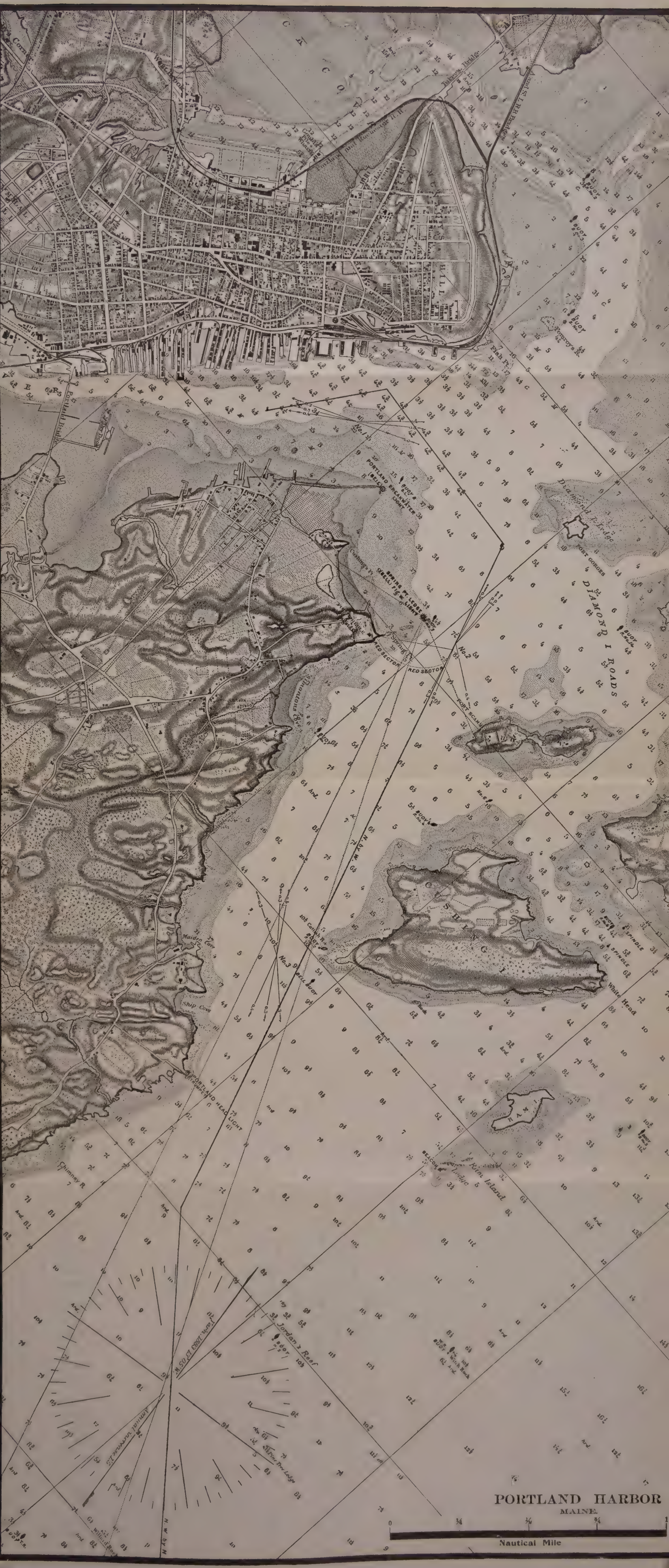
PORTLAND HARBOR
MAINE.
Nautical Mile
DIAMOND I ROADS
PORTLAND BREAKWATER LIGHT
No.1
No.2
No.3
No.4
No.5
No.6
RED SECTOR
Spring Pt. Ledge Light
Portland Head Light
Jordan's Reef
Bramhall's Ledge
Ram Island
Fish Pt.
Tenny's R.
Dia mond I. Ledge
Fort Gorges
Fort Scammel
Spindle
White Head
Maiden Cove
Ship Cove
Chimney R.
Admiral Sumner Ledge
Whitehead Rock
Bakers Island
Cushing I.
Spring Pt.
Cape Elizabeth
Cape Elizabeth Light
Portland Head
Portland Harbor
Fort Preble
Fort Williams
Spring Pt. Ledge
Spring Pt. Ledge Light
Portland Breakwater Light
Portland Head Light
Ram Island Ledge
Jordan's Reef
Whitehead Rock
Admiral Sumner Ledge
Bakers Island
Cushing I.
Fish Pt.
Tenny's R.
Diamond I. Ledge
Fort Gorges
Fort Scammel
Spindle
White Head
Maiden Cove
Ship Cove
Chimney R.
Cape Elizabeth

CURRENT-COURSE PROJECTOR

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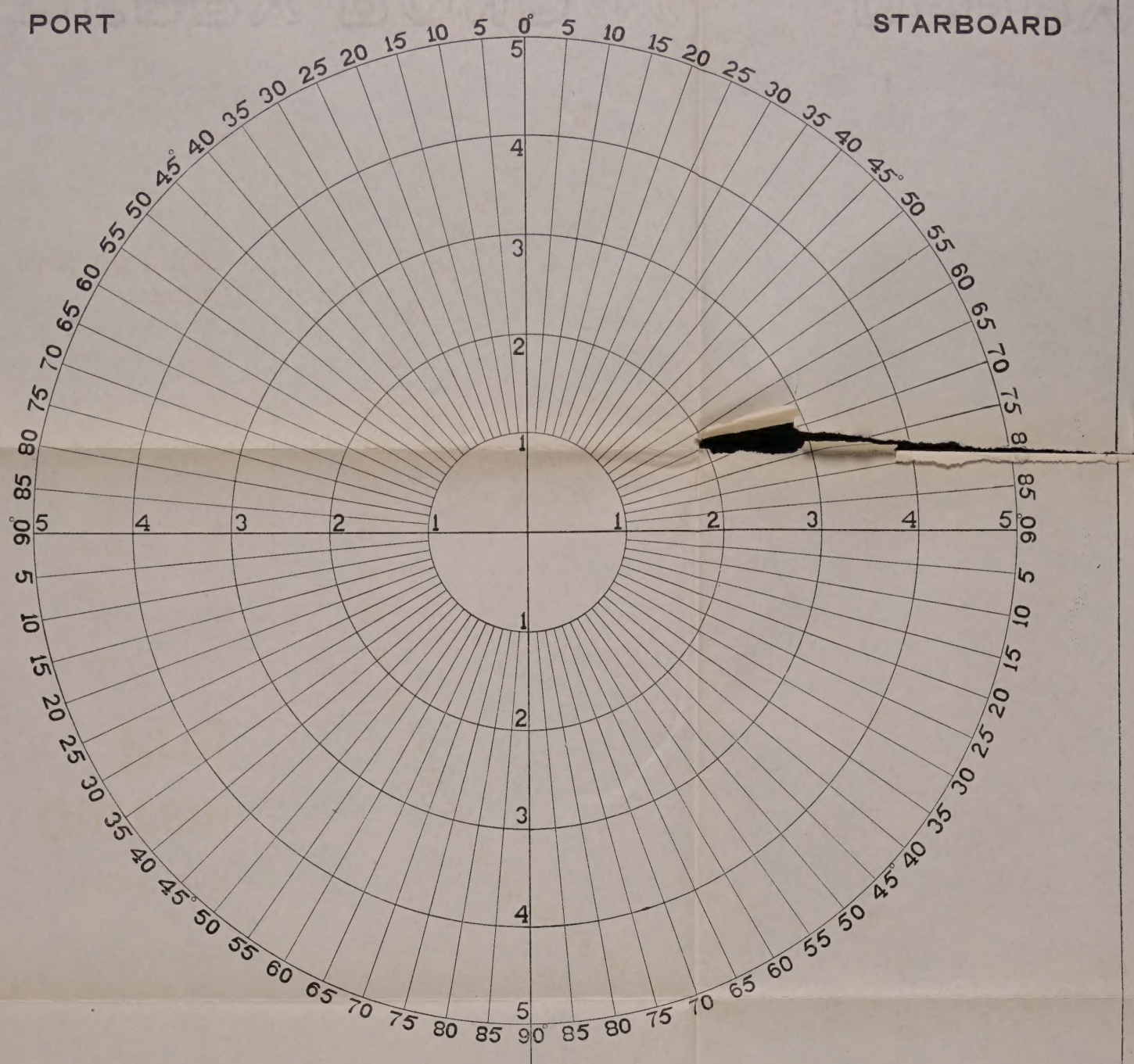

CAPT. R. M. PUGSLEY'S

Current-Course Projector.

The determination of the angle to be allowed for the effect of a current on a ship's course and distance has always been a matter of more or less difficulty and a great deal of guesswork, which have very rarely given satisfactory results.

Some navigators who have the necessary knowledge to project a current-course cannot deny that some considerable time and labor is required to perform the work, and therefore the method is not practicable under certain conditions. For instance, when a ship is sailing across a current which has a different velocity every few miles, such as the Gulf Stream between Key West and Cuba.

By the use of the CURRENT-COURSE PROJECTOR, such difficulties are entirely overcome because the desired result can be obtained by simple inspection at any time and as often as it may be required. The speed and course of the ship and the rate of the current and direction from which it comes is all that is required to obtain the necessary result in one or two minutes.

Instructions for the Use of Capt. R. M. Pugsley's Current-Course Projector.

Some navigators may prefer to count the degrees all on the bow and do away with the term—so many degrees abaft the beam in considering the current. If so the degrees may be so numbered with pen or pencil to suit the notion.

Currents.

A current is always named the same as a ship's course. That is, the course is named after the direction to which she sails. A current is named after the direction to which it sets or runs.

To use the current with this instrument, the direction from which it comes is to be considered.

1. Place the instrument on the chart table or any other convenient place.
2. Set the centre of the compass over the speed per hour of the ship.
3. Turn the compass card till the chart course is on the line marked SHIP'S SPEED PER HOUR.
4. Move the arm till its center line cuts the current at its rate and angle. The center line on the arm will then cut the course to steer by compass to counteract the effect of the current.
5. Note the number of miles on the arm at the intersection of the center line of the arm, with the rate and angle of the current, and it will be the distance to run by log to equal the speed of the ship. See the following examples.

EXAMPLES.

The Current on the Starboard Bow.

Chart course is S. 5° W. The current sets N. 45° E., which is 40° on the starboard bow, at the rate of four knots per hour. The speed of the ship is fourteen knots per hour.

Find the course to steer by compass to make good the chart course and the distance to run by log to make good the ship's speed of fourteen knots.

Answer. Steer S. 14° W. by compass to make good the chart course S. 5° W. The distance to run by log to make good the ship's speed of fourteen knots per hour is 17⅓ miles.

The Current on the Port Bow.

Chart course is N. 20° E. The current sets S. 45° E., which is 65° on the port bow, at the rate of five knots per hour. The speed of the ship is eleven knots per hour.

Find the course to steer by compass to make good the chart course and the distance to run by log to make good the ship's speed of eleven knots per hour.

Answer. Steer N. 1° E. by compass to make good the chart course N. 20° E. The distance to run by log to make good the ship's speed per hour is nearly 14 miles.

The Current Abaft the Starboard Beam.

Chart course is W. The current sets S. 45° W., which is 45° aft of the starboard beam, at the rate of four knots per hour. The speed of the ship is twelve knots per hour.

Find the course to steer by compass to make good the chart course and the distance to run by log to make good the ship's speed of twelve knots per hour.

Answer. Steer N. 73° W. nearly by compass to make good the chart course and the distance to run by log to make good the ship's speed per hour is a little more than 9½ miles.

The Current Abaft the Port Beam.

Chart course is S. 45° E. The current sets south, which is 45° abaft the port beam, at the rate of three knots per hour. The speed of the ship is seventeen knots per hour.

Find the course to steer by compass to make good the chart course and the distance to run by log to make good the ship's speed of seventeen knots per hour.

Answer. Steer S. 53° E. by compass to make good the chart course, and the distance to run by log to make good the ship's speed per hour is a little more than fifteen miles.

Note.

As the compass is not given here, a straight-edge properly graduated, and a protractor may be used. A smaller size of this instrument can be obtained complete of any dealer in nautical instruments.

6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

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Not Affected by Water

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THIN DOWN WITH PURE LINSEED OIL
AND LIQUID DRYERS AND THE RESULTS
OBTAINED WILL BE SATISFACTORY. DON'T
PAINT ON DAMP SURFACES
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FOR USE ON DECK, FLOOR OR PIAZZA.
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LAPS, PAINTING EACH BOARD SEPARATELY. IF
TOO THICK REDUCE ONLY WITH TURPENTINE.
SURFACE TO BE PAINTED MUST BE THOROUGHLY DRY
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